

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

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Number 4

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如何となれば回轉
に從ふべき機械に
是れを併用又は應
用なし得、チイム
ケインとは調節の
意味にして取り外
し又は附加の煩を
省き其の代用をな
す

チイムキン回轉機會社
オハヨー州
カントン市

—because they can be taken up for the wear that *must* follow motion, Timkens mean adjustment instead of replacement

The original Japanese, and the American translation, of a Timken Bearing advertisement printed in *Jiji Shimpō* of Tokyo, and *Shin Aichi* of Nagoya

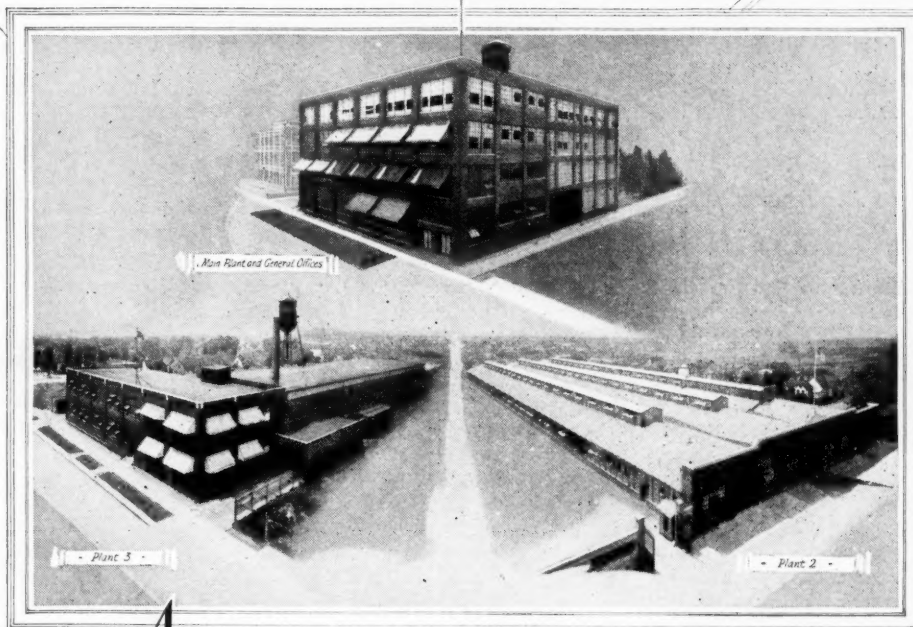
THE TIMKEN ROLLER BEARING CO, CANTON, OHIO

Timken Tapered Roller Bearings for Passenger Cars, Trucks, Tractors, Trailers, Farm Implements, Machinery, and Industrial Appliances

TIMKEN

Tapered

ROLLER BEARINGS



Concentration in Buying

There are clear, logical, convincing reasons why it is to your advantage to purchase *all* of your automobile body hardware from one source. These reasons will come to your desk and appear in your trade magazines. Look for them. Read them. Digest them.

FOUR years ago—a small machine shop with few workmen and meager equipment—but with a definite policy of building a *quality* product—the Ternstedt Window Regulator.

Today—three giant, up-to-the-minute factory structures, totaling more than 200,000 square feet of working space, echoing to the daily hum of industry—in these buildings the finest of modern equipment, manned by 1500 conscientious *workers*, each a skilled craftsman on his particular job—the same policy of *quality* prevailing, only intensified.

Today, Ternstedt will supply you with *complete* hardware equipment for all closed body work, with many of the items required for open bodies as well.

This enables you to buy *all* of your automobile hardware from one source—to concentrate your purchases in one organization—freeing yourself from the worry, expense and loss of time attendant upon the purchasing of your hardware from a hundred and one different places.

The logic of the idea quickly appeals; to such an extent, in fact, that many companies already have lined up their entire requirements for future production with us.

May we tell you more about it?

TERNSTEDT MANUFACTURING COMPANY, DETROIT

TERNSTEDT

Automobile Body Hardware

... BUILT BETTER FOR BETTER BODIES ...

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLV.

NEW YORK—THURSDAY, JULY 28, 1921

No. 4

9,257,575 Cars and Trucks in Mid-year Registration Census

July figures show gain of 1,354,497 over year ago. New York leads, Ohio second; Maryland has largest percentage gain with 49.15. One car for every 11.4 persons in country. California goes ahead rapidly.

A GAIN of nearly a million and a half is recorded in automobile registrations for July 1, 1921, as compared with July 1, 1920. Despite the serious industrial depression which has swept the country, there is a substantial gain in registrations over the corresponding period of last year. The actual gain, excluding the Minnesota figures, is 1,354,497, an increase of 17.80 per cent. The present registration total is 9,257,575. There is one car for every 11.4 persons in the United States.

For the first time in several years New York has held its lead at the mid-year mark. It holds the premier place, however, with a total registration of 650,530. Ohio is second, with 623,316 cars and trucks within its boundaries, while Pennsylvania is third, with 609,268. Illinois occupies fourth place and makes its first entrance into the 600,000 class.

This figure cannot be taken as a definite statement of the number of automotive vehicles in use at the time the figures are dated. Rather is it a statement of the degree of law enforcement this year. It is a fact that in many agricultural communities the law officer in charge of the enforcement does not require the purchase of new licenses until after the crop money is received in the community. This fact, rather than large purchases, explains the heavy registration that always is reported in the last half of the year.

The fact that the mid-year registration shows an increase of 46,032 cars and trucks over the year end, a percentage gain of .52, is a distinct and clear refuta-

tion of the many prophets who declared that the automotive transportation was a luxury and that a distinct recession in the number of vehicles used would be noted with the need of greater economy in methods of living. There can be no question that many trucks have not been licensed this year—because there is not sufficient industrial activity to demand the available freight transportation—so that the gain must be in passenger vehicles.

Substantial Gains Made

A study of the table of gains and losses from mid-year 1920 to mid-year 1921 indicates a healthy progress for the period. Five states failed to reach the previous total, as against one that was in the minus column last year. These five delinquents, however, are all predominantly agricultural states. In such states it is reasonable to believe that the law has not been strongly enforced up to this time, because of the peculiarly bad position of the average farmer.

This explanation of delinquency being accepted, the loss in Tennessee, South Dakota, Montana and Idaho seems certain to be turned into a substantial gain before the final count is made. The only decrease of importance is in Georgia. Even there, however, the decrease is only 13 per cent of the total of last mid-year. Since it is probable that the laxity in law enforcement is in proportion to the financial status of the farming population, even Georgia bids fair to do well during the remaining months of the year.

California records the largest gain over last July with 167,536, while New York, Texas, Illinois and Pennsylvania follow, each with a gain of more than 100,000. A substantial percentage gain has been made by the chief industrial states over last mid-year. Massachusetts has gone ahead nearly 29 per cent, Michigan about 24 per cent, New Jersey about 21 per cent, New York about 33 and Illinois and Pennsylvania about 20.

It is interesting to compare the gains made in these industrial states during the last year with those made last year over July 1, 1919. The list is as follows:

	July 1, 1920- July 1, 1921	July 1, 1919- July 1, 1920
Massachusetts . . .	28.91	11.04
Michigan	23.81	28.66
New Jersey	21.59	34.88
Illinois	20.75	23.90
Pennsylvania	20.39	24.06
New York	33.79	11.29

These figures indicate that there has been no unusual falling off even in the rate of increase in these key industrial states. This same condition is present to a large extent in the case of nearly all the states.

District Figures Confused

Difficulty has always been experienced in obtaining District of Columbia registration figures. The method of compiling registrations there is apparently very much confused, with result that it is difficult to determine accurately at any given time just what the figures stand for. This confusion has made necessary a correction in the year-end figures for 1921, and on the basis of this correction the actual and percentage gains of the District have been computed. For that reason the present gain and loss figures of the District will not be compatible with the figure given

for total registration in our previous compilation.

Neither the actual nor percentage increase in registrations is given for Minnesota, nor have the Minnesota figures been considered in determining total gains. This is because there is no basis for satisfactory comparison with the past. The total registrations for Minnesota given in the large table constitute the first figures for that State of any real value in determining the number of cars actually in use.

Previous to January 1, 1921, Minnesota had a triennial registration system in which the registrations were cumulative for three years. Thus it was impossible at any given time to determine even approximately the number of cars actually in use. The last legislature changed that system, however, and Minnesota is now on an annual registration basis. No

Registration of Cars, Trucks and Motorcycles.

State or Territory	Total Car and Truck Registration	Non-Resident and Re-Registration	Passenger Cars	Commercial Cars	Motorcycles	Chauffeurs and Operators Registered	Total Fees
Alabama	74,076	.....	61,637	8,227	621	6,591	1,159,526
Arizona	31,175	743	.....	.....	376	89	187,435
Arkansas	58,281	200	.....	.....	132	240	.....
California	588,863	90,840	557,231	31,632	15,161	801,515	6,215,936
Colorado	132,500	.....	125,000	7,500	2,140	5,500	858,435
Connecticut	118,110	.....	94,605	23,505	4,585	15,226	1,876,445
Delaware	18,800	.....	.....	.....	500	21,416	338,804
District of Columbia	52,384	.....	46,498	5,886	1,968	9,504	235,480
Florida	89,698	.....	76,350	13,348	1,153	2,236	690,000
Georgia	118,652	1,500	.....	.....	1,056	3,800	1,646,107
Idaho	46,130	.....	.....	.....	734	603	656,290
Illinois	600,982	.....	531,382	69,600	7,614	53,604	6,247,387
Indiana	344,890	.....	309,450	35,440	5,739	7,189	2,151,543
Iowa	425,356	108,000	407,084	28,272	3,466	6,790	.....
Kansas	287,391	4,147	267,931	19,460	3,398	.....	1,550,930
Kentucky	107,493	.....	94,414	13,079	1,034	7,680	1,678,587
Louisiana	71,000	.....	.....	.....	490	.....	426,000
Maine	65,990	3,120	57,742	8,248	1,168	81,805	865,672
Maryland	112,905	5,648	103,433	9,472	4,062	53,588	2,031,536
Massachusetts	300,027	20,515	250,778	49,249	10,013	204,399	3,842,593
Michigan	435,508	17,002	382,630	44,244	5,252	118,764	5,932,021
Minnesota	294,705	.....	282,130	12,575	2,000	.....	1,000,000
Mississippi	56,114	.....	48,100	8,014	122	.....	.....
Missouri	305,802	8,464	.....	.....	3,081	21,399	1,000,000
Montana	51,500	.....	.....	.....	370	473	.....
Nebraska	215,909	.....	199,861	16,048	1,415	.....	2,652,933
Nevada	9,672	.....	.....	.....	125	.....	98,000
New Hampshire	37,091	.....	.....	.....	1,894	45,246	644,974
New Jersey	237,339	24,228	214,940	22,399	8,295	295,008	3,464,939
New Mexico	23,865	15,086	.....	.....	154	.....	207,585
New York	650,530	.....	505,642	144,888	22,580	.....	9,000,000
North Carolina	147,910	.....	133,846	14,064	1,534	.....	1,800,000
North Dakota	86,310	3,419	84,942	1,368	676	.....	632,241
Ohio	623,316	12,650	547,013	76,303	11,661	.....	5,907,335
Oklahoma	183,000	.....	.....	.....	1,200*	.....	1,951,882
Oregon	102,274	94,032	.....	.....	2,486	163,138	2,153,844
Pennsylvania	609,268	.....	557,765	51,503	18,174	112,199	8,387,106
Rhode Island	46,574	4,142	37,676	8,898	1,524	33,230	604,654
South Carolina	84,632	698	77,323	6,581	684	.....	697,465
South Dakota	113,120	.....	105,620	7,500	625	.....	.....
Tennessee	86,610	2,064	.....	.....	845	.....	1,203,944
Texas	418,126	70,218	.....	.....	3,287	12,930	1,950,520
Utah	41,136	.....	35,730	5,406	792	899	385,053
Vermont	32,758	1,750	29,677	3,081	843	39,824	594,550
Virginia	120,000	5,000	110,000	14,000	1,800	4,500	1,800,000
Washington	159,579	4,654	136,205	23,374	2,924	.....	2,642,832
West Virginia	94,450	3,610	.....	.....	1,250	9,800	1,175,366
Wisconsin	315,774	.....	296,675	19,099	5,505	.....	3,453,225
Wyoming	30,000	.....	28,800	1,200	282	.....	263,813
TOTALS	9,257,575	501,730	6,798,110	803,463	166,790	2,139,185	\$97,661,982

*Estimated.

single factor has been responsible for so great differences in various registration compilations as the Minnesota figures. It is good to know that this one difficulty, at least, has been eliminated.

Even the present figures are probably none too accurate as indicating the number of cars now in use in Minnesota, however, since the legislature made no provision for registration until just before its adjournment, and officials are having some difficulty in getting the new system into efficient operation. Our correspondent states that "hundreds of cars are still carrying 1920 numbers."

The figures indicate anew the necessity for uniform methods of car and truck registration. The increased

Gains and Losses in Registration, July 1st, 1920—July 1st, 1921

California	167,536
New York	164,268
Texas	119,892
Illinois	103,664
Pennsylvania	103,183
Michigan	83,746
Massachusetts	66,769
Ohio	56,316
Missouri	47,324
Indiana	42,582
New Jersey	42,081
Maryland	37,205
Wisconsin	35,322
Kansas	33,495
North Carolina	24,910
West Virginia	24,362
Florida	22,580
Colorado	20,593
Iowa	20,174
Connecticut	17,560
Washington	16,018
Virginia	15,000
Maine	14,207
Kentucky	13,428
Oregon	12,341
North Dakota	9,357
District of Columbia	9,055
Louisiana	9,033
Wyoming	8,750
New Hampshire	6,676
Vermont	6,122
South Carolina	4,070
Utah	3,875
Nebraska	3,779
New Mexico	3,565
Rhode Island	2,574
Delaware	2,200
Oklahoma	1,800
Alabama	1,650
Arkansas	1,419
Arizona	1,372
Nevada	289
Minnesota	?
Gains:	1,380,142
Losses:	
Georgia	18,477
Tennessee	4,164
South Dakota	1,288
Mississippi	886
Montana	600
Idaho	230
Losses:	25,645
Net Gain.....	1,354,497

Car and Truck Registration

	July 1, 1921
New York	650,530
Ohio	623,316
Pennsylvania	609,268
Illinois	600,982
California	588,863
Michigan	435,508
Iowa	425,356
Texas	418,126
Indiana	344,890
Wisconsin	315,774
Missouri	305,802
Massachusetts	300,027
Minnesota	294,705
Kansas	287,391
New Jersey	237,339
Nebraska	215,909
Oklahoma	183,000
Washington	159,579
North Carolina	147,910
Colorado	132,500
Virginia	120,000
Georgia	118,652
Connecticut	118,110
South Dakota	113,120
Maryland	112,905
Kentucky	107,493
Oregon	102,274
West Virginia	94,450
Florida	89,698
Tennessee	86,610
North Dakota	86,310
South Carolina	84,632
Alabama	74,076
Louisiana	71,000
Maine	65,990
Arkansas	58,281
Mississippi	56,114
District of Columbia	52,384
Montana	51,500
Rhode Island	46,574
Idaho	46,130
Utah	41,136
New Hampshire	37,091
Vermont	32,758
Arizona	31,175
Wyoming	30,000
New Mexico	23,865
Delaware	18,800
Nevada	9,672

prominence of territorial analysis in merchandising has rendered accurate registration statistics of even greater importance to the industry than ever before. Such statistics can never be obtained while the present confusion of State laws and methods remains.

The difficulty lies not so much in the deficiencies of particular State laws as in the lack of uniformity of practice, which makes it impossible to accurately correlate the figures of the various states. It is true, however, that the actual practice in many states is loose, inaccurate and confused.

As long as this is the case it will be necessary to compile and interpret registration statistics with extreme care. Gross errors can be made by a superficial acceptance of figures obtained from State officials, or even from published compilations, unless the factors of variation and error are understood.

Mid-year figures, in particular,

should be accepted for what they are—an indication of the trend for the year. It is not always possible to get the totals as of July 1 exactly, and it is obvious that one day or week in variation in the date at which the figures were given would mean considerable difference in the totals.

Basis of Comparison

It is possible to compare only like units, if the results obtained are to be fair. The July 1, 1921, figures, for example, can properly be compared in every way with those of July 1, 1920. It is fair to judge the present status on the basis of the status at the same time last year, and it is in this way that the chief comparisons in this article are made.

Mid-year and year-end figures are not commensurate. The enforcement of the law varies greatly, for in-

Percentage of Gains and Losses in Registration, July 1st, 1920—July 1st, 1921

Gains:	
Maryland	49.15
Wyoming	41.20
Texas	40.00
California	39.98
West Virginia	34.75
New York	33.79
Florida	33.50
Massachusetts	28.91
Maine	27.50
Michigan	23.81
Vermont	22.96
New Hampshire	21.89
New Jersey	21.59
District of Columbia	20.90
Illinois	20.75
Pennsylvania	20.39
Colorado	18.38
New Mexico	17.78
Connecticut	17.51
Missouri	16.81
Louisiana	14.60
Kentucky	14.59
Indiana	14.28
Virginia	14.28
Oregon	13.75
Delaware	13.25
Kansas	13.16
Wisconsin	12.59
North Dakota	12.31
Washington	11.19
Utah	10.40
Ohio	9.94
Rhode Island	5.84
South Carolina	5.05
Iowa	4.95
Arizona	4.59
Nevada	3.08
Arkansas	2.49
Alabama	2.38
North Carolina	2.02
Nebraska	1.15
Oklahoma .....	.99
Minnesota	?
Losses:	
Georgia	13.60
Tennessee	4.60
Mississippi	1.58
Montana	1.15
South Dakota	1.09
Idaho .....	.49
Average gain.....	17.80%

Gains and Losses in Registration, January 1st—July 1st, 1921

Pennsylvania	39,104
Illinois	32,223
Michigan	22,791
Wisconsin	22,476
Kansas	21,995
California	19,971
Florida	15,784
West Virginia	15,588
Indiana	12,183
New Jersey	9,602
Missouri	8,883
Ohio	7,919
North Carolina	7,050
Wyoming	6,074
Louisiana	5,000
Colorado	3,549
Maine	3,083
New Hampshire	2,411
New Mexico	1,756
Vermont	1,133
Delaware	500
Minnesota	?

259,075

Losses:

Georgia	25,770
Oklahoma	21,300
New York	18,760
Tennessee	15,242
Washington	14,341
Virginia	14,000
Iowa	11,944
Texas	9,567
Montana	9,146
South Carolina	8,186
Mississippi	7,370
South Dakota	7,275
District of Columbia	7,225
Nebraska	7,091
Kentucky	5,192
Idaho	4,743
Massachusetts	4,604
North Dakota	4,530
Rhode Island	3,801
Maryland	3,436
Arizona	3,384
Oregon	1,516
Utah	1,442
Connecticut	1,024
Arkansas	801
Nevada	792
Alabama	561

213,043

Net gain..... 46,032

stance, in the different states, and a State may appear below normal in July simply because no attempt has been made to enforce the law until late in the year. Especially is this true of agricultural states and communities where the sheriffs frequently make no attempt to collect license fees until crops are harvested.

The past record of New York illustrates this point clearly. Every year, recently, New York has been behind Ohio on the basis of July 1 figures, but always shows a proportionately large gain during the last six months and passes Ohio in the final tabulation by many thousands.

Thus the failure of a State to attain last year's total by July 1 is of little significance. Where a State has passed the final figure of 1920,

however, some importance may be attached to the fact, since a gain for the year is already assured.

Comparison of Year-End and Mid-Year Figures

It is with this thought clearly in mind that an examination of these mid-year figures, as compared with the year-end figures for 1920, should be made.

The mid-year total is 46,032 in excess of the high point reached last December. This is a gain of .52 per cent and insures a 1921 gain in automobile registrations. The previous discussion of delayed law enforcement applies with equal force in making this mid-year and year-end comparison.

While 27 states have thus far failed to reach their year-end total, the 21 which did surpass their previous record more than overcame the losses. The big industrial states, which may be said to reflect the business trend of the country, practically

Motorcycles

Gains and Losses, July 1, 1920, to July 1, 1921.

(Based on available figures from 36 states)

Gains:

New York	7,416
Dist. of Col.	1,395
Nebraska	315
Georgia	152
Oklahoma	134
Idaho	77
Maryland	62
North Carolina	34
Wyoming	8
Florida	4
Maine	4

9,601

Losses:

Ohio	8,339
Pennsylvania	2,103
California	2,038
Wisconsin	1,929
Massachusetts	1,870
Indiana	1,631
New Jersey	1,370
Washington	985
Kansas	864
Colorado	607
Missouri	464
Alabama	323
Illinois	297
Texas	269
Mississippi	233
Connecticut	215
Virginia	200
Montana	180
Kentucky	159
Arizona	98
New Hampshire	74
Delaware	73
North Dakota	52
Iowa	46
South Carolina	6
Nevada	2

24,472

Net loss 14,871

Percentage Gains and Losses in Registration, January 1st—July 1st, 1921

Gains:

Wyoming	25.40
Florida	21.36
West Virginia	19.76
Kansas	8.29
New Mexico	7.99
Wisconsin	7.68
Louisiana	7.60
Pennsylvania	6.85
New Hampshire	6.02
Illinois	5.68
Michigan	5.51
Maine	4.92
North Carolina	4.90
New Jersey	4.24
Indiana	3.66
Vermont	3.58
California	3.39
Missouri	2.98
Delaware	2.73
Colorado	2.68
Ohio	1.29
Minnesota	?

Losses:

Georgia	17.80
Montana	15.10
Tennessee	15.06
District of Columbia	13.81
Mississippi	13.11
Virginia	10.44
Oklahoma	10.40
Arizona	9.85
Idaho	9.34
South Carolina	8.84
Washington	8.27
Rhode Island	7.59
Nevada	6.79
South Dakota	5.99
North Dakota	4.99
Kentucky	4.61
Utah	3.39
Nebraska	3.18
Maryland	2.98
New York	2.86
Iowa	2.73
Texas	2.24
Massachusetts	1.53
Oregon	1.47
Arkansas	1.36
Connecticut .....	.87
Alabama .....	.24

Average gain..... .52%

all show substantial gains. The four leaders in this respect, for instance, are Pennsylvania, Illinois, Michigan and Wisconsin. This is a decidedly encouraging sign. New York's drop is simply consistent with its normal course every year, as previously explained, while the Massachusetts decrease is only 1.5 per cent.

The largest decrease, both in actual numbers and in percentage, is shown by Georgia. This State has 25,770 less registrations than on January 1, 1921, a decrease of 17.80 per cent. Seven states showed a decrease of more than 10,000, while nine states gained more than 10,000.

Comparison of mid-year motorcycle figures is not possible in all cases, because midyear figures were not available last year from every state.

country—this car is geared to run 40 m.p.h. at a little under maximum engine speed. A time card of this run is given; it shows that the car works in conjunction with the steam mixed train, but that the car has several flag stops to make—its schedule is faster than the train's.

From the train record sheets, it is shown that this car ran 2577 miles in the first month of its operation with a consumption of 266 gal. of gasoline and 19 gal. of oil. The first few days of operation the gasoline consumption was high, but as the mechanism "found itself" the curve dropped enough to show an average mileage of 10 per gal. for the whole month. The following months the average mileage was higher. A 31-passenger car of similar construction on the same road geared to run a maximum of 30 m.p.h. has shown practically the same mileage.

Taking these figures, we may arrange a chart of operating expenses as shown below. Explaining the items, the driver's pay is figured at 60 cents an hour, a helper at 40 cents an hour, four hours a day to clean the car and assist in filling tanks, etc., and the chief item of repairs includes a proportionate mileage charge for replacing a master gear and pinion installed near the 6000th mile when a thrust collar loosened up and chipped off a tooth.

Gasoline	\$79.80
Oil and waste	21.00
Insurance	25.00
Driver	162.00
Helper	43.25
Repairs	20.00
Depreciation	125.00
	<hr/>
	\$476.05

Dividing this by the mileage, 2577, we find the investment and operating charge amounts to 18½ cents a mile. The railroad is permitted to charge a passenger rate of 5 cents per mile. Without a doubt, no other type of rolling stock would show as well under a similar analysis.

Features of the Body

The body is designed to provide maximum seating capacity in minimum length, the primary object being to avoid overhang at the rear. Overhang is objectionable because of the swing on curves, especially in yards, and it puts a greater load on the rear axle. The body follows somewhat that of "safety" street cars in offering maximum capacity with simple operation and light weight, though the construction is much heavier than

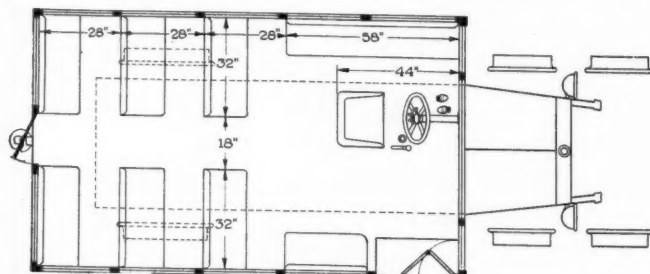


FIG. 2 - FLOOR PLAN

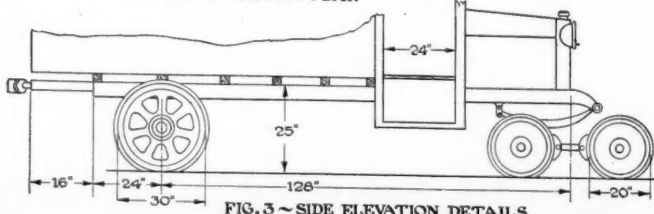


FIG. 3 - SIDE ELEVATION DETAILS

Fig. 2—Plan and Fig. 3, side elevation of body layout employed

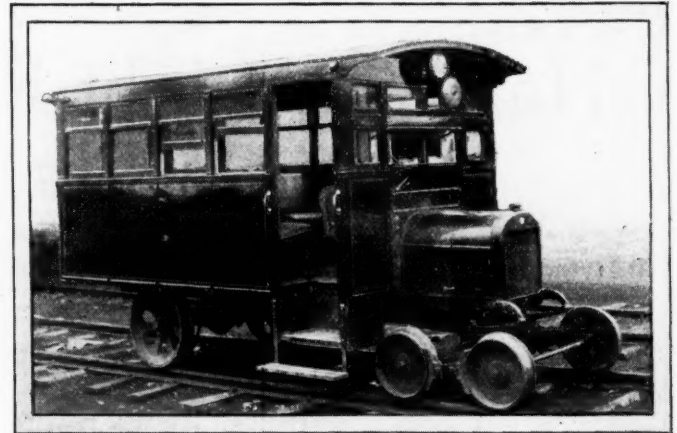


Fig. 1—A Rec Speed Wagon with special body, fitted for operation on rails

ordinary bus jobs. One feature of construction follows a truck design described in *AUTOMOTIVE INDUSTRIES*, Aug. 12, 1920, in that there are no longitudinal center sills—the chassis frame answering for these—the cross sills, 2 x 3-in. ash, rest on and are bolted to the frame, with their ends leaded and mortised to the side sills. Not only is weight saved but the body is that much lower.

Fig. 2 is a floor plan and shows the seating arrangement. There is a safety door at the rear, normally blocked by a seat cushion, and an entrance at the right of the driver with a leaf door operated by him. Hand holds are provided inside and out. The inside finish is natural wood, matching the rattan seats and presenting a bright, clean appearance. The seats are full size and comfortable, spaced according to street car practice, and the general riding effect is equal to or better than that of street cars and far better than highway buses.

The seating arrangement insures maximum traction with any load; cross seats are always preferred to longitudinal ones and these, directly over the driving wheels, always fill up first. Designed for 19 passengers, this car is often grossly overloaded, records of the afternoon trip showing as high as 33 carried. It is customary to estimate passenger loads at 160 lb. per person—this rating makes the ratio (full load) of paying load to dead weight 3040 to 5400—a most unique record in railroading!

Two points in body construction are different from bus body practice—they may be noted in the photo. Windows set a few inches higher become a safety feature because they guard against hands and arms thrust out of them. Bodies ordinarily have swinging front windows which may be adjusted and held by a fastening—this construction is frail and develops a bad case of rattling after a few weeks' service. In this car the windshield is left in place and the body built to surround it; by so doing, first class steel and glass construction, permanent and quiet, takes the place of ramshackle parts.

Railroad Equipment

Some of the features applied particularly for railroad service may be noted by reference to the photograph. These are the electric marker lights, front and rear, electric headlight, sand boxes and brakes. The wheels conform to Master Car Builders' shape and have hard faces. A lever at the driver's right, under his seat, operates the gates in the sand boxes, which are of the hopper bottom type and located inside the car under the seats where it is dry. An exhaust whistle is used for signals. At the rear of the car is an M.C.B. automatic coupler. This is attached without draft gear, which has been found unnecessary for starting one trailer.

The car is ball and roller bearing throughout. It offers a resistance of 15 lb. per ton in starting, dropping off to 10 lb. at 4 m.p.h. One man can easily push the car on a level tangent. It has a theoretical tractive effort of high gear of 182 lb. and has shown its actual pulling ability by hauling the larger car as a trailer (weighing 9000 lb.) and making its time card schedule.

Brakes are provided all around. They make for rapid deceleration and consequent improved running time. A pedal operates the band brake on the rear wheel drums just as in automobile practice. The front truck has regulation brake shoes carried on I-beams, inside hung.

The method of hooking up the front truck brakes is novel and proved successful from the start. Fig. 4 shows the scheme. It was evolved to allow the front truck the greatest swivel movement ever necessary, to avoid the use of cables or chains or radius bars, and yet to have the brakes always in position to be applied with the same amount of hand wheel movement, this to be the least possible consistent with brake shoes free from drag. The otherwise useless steering wheel is used for a hand brake wheel, as in all front truck braking systems. A ratchet and pawl are unnecessary with such a brake on a gasoline car as holding the pressure for the few seconds at a time required imposes no hardship on the driver.

Referring to Fig. 4, power applied to the 18-in. wheel is transmitted through arm and drag link to a ball joint at the end of the lever H, which engages the square head of the truck king bolt J at whose lower end is keyed the cam K, which spreads the brake beams. A turnbuckle (not shown) in the drag link and the substitution of a sector D, which is nearly half a circle in extent, permit adjustments for wear and position. It is evident that as the truck swivels the brake beams turn the cam between them—there is no backlash to take up and this turning merely rotates the steering wheel. The greatest movement of the latter is that necessary to take up the running clearances and the spring in the parts—track layout has nothing to do with it. The front truck has a swivel center bearing and it has a tubular center "pin" surrounding the king bolt and relieving the latter from binding.

Applying Railroad Equipment

Disregarding the matter of bodies, the process of applying these standardized railroad members is very simple. The easiest way when possible is to do the work where there is a pavement flush with the rails. If not this, the car is run on a crossing or planks are laid ad-

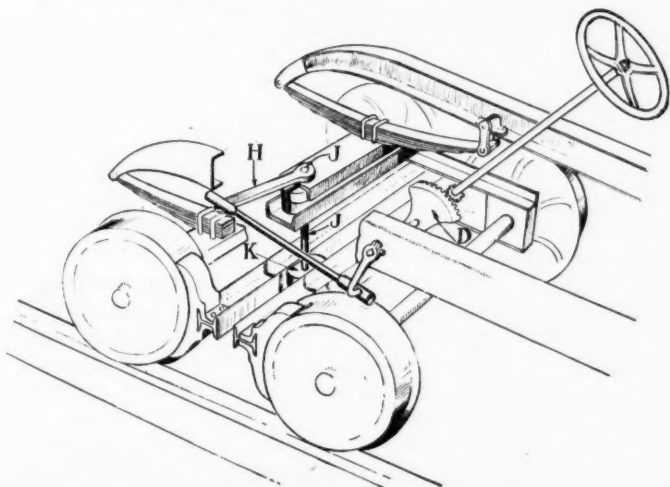


Fig. 4—Sketch showing method of applying brakes to wheels of the truck



Fig. 5—Narrow gage car designed for use on a South American railroad

jacent to a crossing or a spot selected with earth the full height of the rails. The chassis is run to the selected spot on the rubber tires and placed directly over the rails. Jacking up the rear end, the wood wheels are disassembled from the hubs and the metal ones put in place, using the same bolts. Then the front end is jacked up and the axle with wheels intact removed; the front truck, already on the rails, is run back, the car lowered and the spring clips attached to the body bolster. Not even an extra cotter pin is needed. With the engineering work properly done, the change can be made in three hours and the erstwhile motor truck becomes a railway car—such are the essentials, other equipment is a matter of selection.

Narrow Gage Roads

Heretofore, we have considered only equipment for the U. S. standard gage of 56½ in. Fig. 5 illustrates a narrow gage car that has been running in South America for about a year. Its run is over the line of a 42-in. gage steam road with a first class roadbed about 150 miles in length. Part of the line is situated on the high plateau at an elevation of 3½ miles, then it descends to the lowland country, where it is intensely hot and moist. As is usual with these Andes railroads, the curves are sharp and the grades are steep; to successfully cope with these, a swivel front truck is applied, powerful brakes all around, 30-in. drivers are used, and the gear ratio made 4.7 to 1 on high.

So great an elevation and temperature range is a severe test of engine operation. Trouble in this respect was foreseen and the original layout included additional cooling capacity for the hot region and protection for the radiator and circulating water when traveling in the section of rarified air—these units to be controlled by handles placed within the driver's reach. However, it was finally decided to try the car without these and up to the present time, the dash carbureter adjustment has taken care of thermal conditions fairly well.

Altering the rear end for 42-in. track forced the removal of the brake drums. In their stead brake shoes and a brake beam were installed. Both here and on the front truck, extra leverage is provided to serve on the numerous steep descents. The truck brakes are of the design shown by Fig. 4; a leverage of 95 to 1 is provided. Brake shoes and holders are standard M.C.B. pattern and interchangeable with like parts on the road's steam equipment.

The chassis is the same as that of Fig. 1. The photograph shows the car about to be boxed for export. It shows also the sand boxes with operating connection terminating in a lever convenient to the driver's hand; a spring catch holds this lever so the pipe opening is

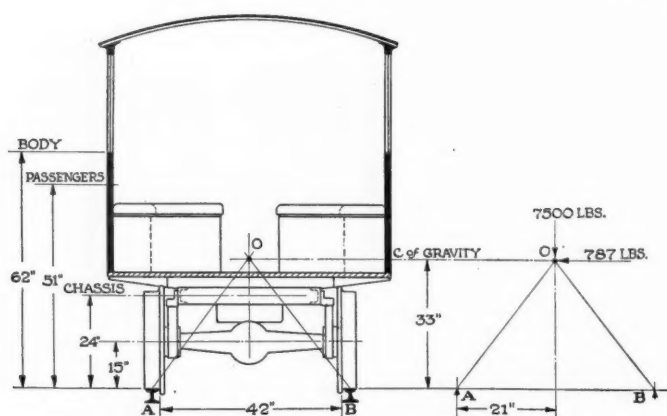


Fig. 6—Diagram showing effect of centrifugal force in rounding curves

normally closed. The body is one of the familiar bus bodies seating 15 passengers on longitudinal leather-covered seats. The seat cushions are tilted to the rear and extra padding put in cushions and back to make more comfortable riding over long distances. Provision is made for exhaust heating.

The Matter of Stability

In analyzing the various conditions and possibilities in connection with operation on the narrow gage railroad mentioned above, the question of overturning was considered. This has frequently been raised in connection with safe operation of motor passenger cars at high speed.

Refer to Fig. 6. The various units that go to make up

the weight were separated and their center of gravity determined; from these the center of gravity of the whole was found to be located at a point 33 in. above the rail. This is 21 in. below the maximum allowable height for safety on a 42-in. gage of track. The triangle O A B in Fig. 6 outlines the case. The total weight of car and load is 7500 lb.—it may be resolved into components bearing on each rail head.

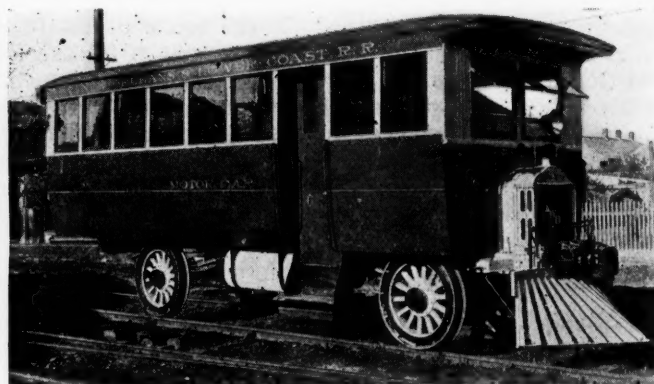
The forces tending to overturn the car or cause it to mount the rail are (1) centrifugal force in rounding a curve, (2) wind pressure against side of car, (3) sway of the body. Consider the last first as it is least important; it is the lurch or swing of the body about spring joints as the leaves bend—a 72-in. wide body on springs spaced 36 in. with properly selected springs has negligible power to create serious sway.

Centrifugal force is figured directly from the car speed and degree of curve and car weight by the equation

$$F = 0.00001167 V^2 D W$$

which for the 7500-lb. car entering a 10 deg. curve at 30 m.p.h. is only 787 lb. Assuming this to act at the center of gravity and tending to overturn the car at either the point A or B, its moment is $787 \times 33 = 25,791$ -in.-lb. This must lift the weight concentrated at the center which reduces its effect at that point by dividing by half the track gage, giving 1238 lb. that is resisted by a weight of 7500 lb. A factor of safety of 6 is thus revealed.

Wind pressure at 35 miles an hour would exert an effect equal to that of the centrifugal force, though slightly higher up. The combined stresses are even then well on the side of safety—rational operation would never place a car in position to receive the extreme conditions named.



(Left) Interior of motor-passenger car, showing seating arrangements for thirty passengers and two operators. This car was made by building a passenger car body on a three-ton F.W.D. motor truck and has been installed on the run of 50 miles between Algiers, La., and Buras, La., by the New Orleans and Lower Coast Railroad. (Right) Three-ton, Four-wheel-drive truck converted into passenger car and installed on the New Orleans and Lower Coast Railroad, near New Orleans, to replace entire passenger train of locomotive and five cars, formerly operated over a fifty-mile run between Algiers and Buras, La.

Automotive Interest in Chemical Exposition

AT the urgent requests of numerous automotive engineers and manufacturers, motor boat and airplane builders, special attention will be given to the requirements of the automotive industry in the Seventh National Exposition of Chemical Industries during the week of Sept. 12, in the Eighth Coast Artillery Armory, Jerome Avenue and Kingsbridge Road, New York City. The setting for the chemical display this year will be in the building that housed the last N. A. C. C. motor truck show. The display promises to be the largest ever held.

Dyes are, of course, of interest to the automotive industry, since the enduring qualities of body and upholstery coloring mean so much to the looks of a car after it is some months old. Enamels, paints and processes will

be illustrated at the exposition and illustrated lectures on these subjects will be given by experts. Members of the Society of Automotive Engineers will be invited to attend these sessions.

Fuel and substitutes for gasoline are of interest to automotive men, and the lectures and demonstrations that will be part of the exposition will tell of the progress made in these lines. Recent discoveries in the manufacture and use of low test fuel will be of value to engineers, likewise many new metals and alloys will be on view. Studies made in aviation materials—the treatment of woods, fabrics, etc.—will be exhibited.

There will be more than 450 exhibits in the exposition and these will cover five city blocks of space.

Highway Research Board Outlines Its Program

Selection of Prof. W. K. Hatt as director marks beginning of definite steps toward carrying out of work outlined at the conference in New York last November. Influence of the highways on design one problem.

THE Advisory Board on Highway Research of the National Research Council announces that it has engaged as director, William Kendrick Hatt, Professor of Civil Engineering and Director of Materials Testing Laboratory of Purdue University. He is a member of the American Society of Civil Engineers, the American Society for Testing Materials, the American Railway Engineering Association and other technical societies. His work as an investigator in organizing the timber investigations of the United States Forest Service and in other engineering and scientific fields for the past twenty years is well known. His office is in the building of the National Research Council, 1701 Massachusetts Avenue, Washington.

This Advisory Board was established by the Division of Engineering of National Research Council, with the co-operation of Engineering Foundation, as the result of a conference held in New York, Engineering Societies' Building, last November, attended by many representatives of national engineering societies, associations of vehicle and road materials' manufacturers, Federal Bureau of Public Roads, State highway departments and universities.

By the terms of the by-laws, the membership of the Advisory Board is composed of those organizations of national importance interested in design, construction, economics, maintenance and financing of highways, in materials and equipment therefor, and in vehicles used on highways; governmental departments and bureaus of similar interests, and higher educational institutions. The present organization members are:

American Association of State Highway Officials.
American Concrete Institute.
American Institute of Consulting Engineers.
American Society of Civil Engineers.
American Society of Mechanical Engineers.
American Society for Municipal Improvements.
American Society for Testing Materials.
Association of American State Geologists.
Bureau of Public Roads, U. S. Department of Agriculture.
Corps of Engineers, U. S. Army.
Engineering Foundation.
Federal Highway Council.
National Automobile Chamber of Commerce.
National Highway Traffic Association.
Society of Automotive Engineers.

The officers of the board are: Anson Marston, chairman, director, American Society of Civil Engineers, member of Iowa State Highway Commission, and Dean of Engineering, Iowa State College; Alfred D. Flinn, vice-chairman, secretary, Engineering Foundation, and vice-chairman, Division of Engineering, National Research Council. Other members of the Executive Committee are Thomas H. MacDonald, chief, Bureau of Public Roads, Department of Agriculture; George S. Webster, president, American Society of Civil Engineers, consulting

engineer, formerly director, Department of Wharves, Docks and Ferries, Philadelphia; Henry M. Crane, chairman, Research Committee, Society of Automotive Engineers; W. K. Hatt, director.

In addition to the member organizations, thirteen State highway departments and more than forty universities have definitely signified their interest in the work of the Advisory Board and their willingness to co-operate.

The purposes of the board are:

- To assist existing organizations in outlining a comprehensive national program of highway research and co-ordinating their activities thereunder;
- To organize committees for specific problems;
- To act in a general advisory capacity;
- To serve as a clearing house for highway research information.

Three technical committees have been at work for a number of months. These are:

- Committee on Economic Theory of Highway Improvement, Chairman, Professor T. R. Agg, Iowa State College.
- Committee on Character and Use of Road Materials, Chairman, H. S. Mattimore, Engineer of Tests, Pennsylvania State Highway Department.
- Committee on Structural Design of Roads, Chairman, A. T. Goldbeck, Engineer of Tests, Bureau of Public Roads, Department of Agriculture.

The Executive Committee of the Advisory Board has the creation of additional committees under advisement, such as committees on Vehicle Design as Related to a Road, on Economics and Cost of Transport, on Financing Highway Improvements, on Traffic Studies, and on Organization of Construction Plants.

Much valuable experimental research work is being done by the Bureau of Public Roads, the United States Army, several State highway departments, the universities and a few associations of manufacturers of vehicles and materials.

Two of the most important elements of the strength of the Advisory Board are the membership and the active participation of the Bureau of Public Roads and the army engineers. The bureau is represented by its chief, Thomas H. MacDonald, who is supporting the research work most loyally and intelligently. To represent the Engineer Corps of the Army, the chief of engineers appointed Colonel E. Eveleth Winslow, stationed at New York, and the appointment was officially confirmed by the Secretary of War. Major Mark L. Ireland of the Quartermaster's Corps is a member of the Committee on Economic Theory of Highway Improvement. During the summer, with the co-operation of the Massachusetts Institute of Technology, Major Ireland will conduct at Cambridge, Mass., an important series of tests on the traction resistance of vehicles and of road surfaces. Equipment and supplies have been provided and the necessary assistants assigned by the Army.

Director Hatt's work is expected to stimulate experimental work by such organizations to much greater activity, just as the work of the existing committees of the board has already had a stimulating effect. The director, in consultation with the Advisory Board, will prepare a comprehensive plan of the field of highway research, including economics, design, construction and administration, and will arrange a program of committee work for those fields that need to be occupied immediately.

The personnel of these committees will include active research workers within the State highway commissions, the universities, the governmental departments and other research organizations. A census will be taken of the research work completed and current, and the various research agencies will be invited to co-operate in an attack on those urgent problems upon the solution of which the future success of highway transport depends.

The Advisory Board will not duplicate the efforts of existing research groups. Indeed, it will not do any research work directly, but will act rather to promote a co-ordinated effort in a consistent national program, suggesting problems to those organizations best fitted to attack them. It will also serve as a clearing house for information.

As one highway commissioner has expressed the present need: "I have \$10,000,000 to spend on roads in my State this year. I know that I could save \$500,000 by properly directed research studies. If your board will

tell me what other states are finding out and what research work I should do to supplement their efforts, I will supply all the necessary men and funds." When it is considered that the funds available for the road construction program alone in the United States represent the expenditure of \$1,000,000,000, the cost of the overhead organization, such as that of the National Research Council, to unify research, is insignificant. There is abundant money available for the research itself. The Advisory Board on Highway Research of the National Research Council is in a position to co-ordinate such expenditures in a comprehensive national program.

An informational service, giving the results of current studies and advances in the art, will be supplied to various co-operating bodies at frequent intervals.

The program for highway research will not be limited to problems concerned with the construction and maintenance of roads from the ordinary engineering standpoint. It will also consider those important problems of economics of transport upon highways in relation to other transport agencies, the relation of the design of vehicles to the character of road construction, and the important problems of administration involving traffic regulation, fees and maintenance.

This is the first effort seriously to attack the whole problem of highway transport. With the earnest desire of all interested to co-operate, the efforts of the National Research Council, seconded by Engineering Foundation and national engineering societies, should be effective.

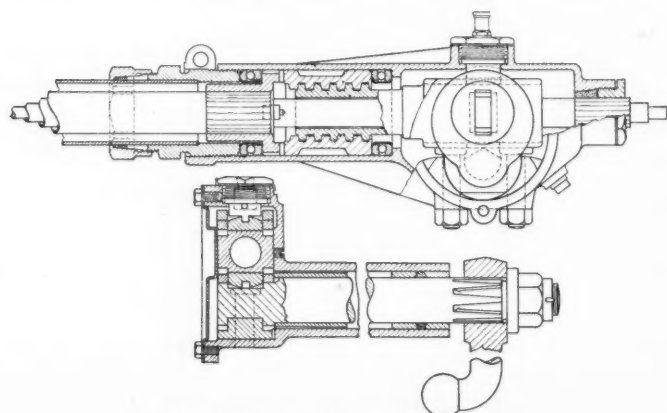
A Steering Gear for Passenger Cars

A PASSENGER car steering gear of similar design to models produced heretofore for truck applications only is now announced by a well-known parts maker. In the new design the connection between the steering tube and the nut is a four-jaw connection without brazing. The screw threads are turned on one end of a forging, on the other end of which there is a rectangular opening. In this opening a rectangular piece of steel is inserted, which projects far enough on either side of the screw to engage rectangular openings in two swivels, one of which operates on either side of the screw forging. The rectangular openings in the swivels are long enough to permit the swivels to move transversely with the center line of the steering column. These swivels operate in two circular openings which are machined in two fingers projecting from the trunnion shaft. The distance between the center line of the openings in the fingers and the center line of the trunnion shaft is $15/16$ in. The resulting action when the nut is turned by turning the

steering wheel is that the screw moves up or down with the rotation of the nut. In so doing it carries along the rectangular block, which in turn carries the swivels, and rotates the trunnion shaft. The rotation of the trunnion shaft moves the steering arm forward or backward.

The advantages of this type of steering gear lies in the large bearing surfaces between the various operating parts. Large bearing surfaces tend toward safety, reliability and easy steering, as well as toward a reduction of wear on the threads. The new design is 2 in. wide at its lower part and the upper part of the housing, which also contains the ball thrust bearings, is only $2\frac{1}{2}$ in. in outside diameter. This narrowness facilitates installation of the gear in passenger cars.

Ball thrust bearings are provided to take the end thrust of the nut in both directions. The trunnion shaft is $1\frac{1}{4}$ in. in diameter and the steering arm is secured to the trunnion shaft by means of six taper splines. The steering gear is manufactured by the Ross Gear and Tool Co.



Ross steering gear for passenger cars

ACCORDING to W. T. Bonner, where both sets of brakes act on the same brake drum, it is a much better plan to secure the friction lining to the brake drum than to the brake bands, as is now the common practice. The heat generated by the friction of the brake no doubt is carried off quicker if the lining is on the drum, as it does not have to pass through the lining. It is claimed that the wear of the friction lining is more uniform and the lining wears much longer. Only one set of rivets are required for securing both the inner and outer linings. One objection would seem to be that since the service brake is used practically all the time, its friction lining will wear out much sooner than that of the emergency brake, and if both linings are secured by a single set of rivets, renewal of one lining alone involves difficulties.

Effect on Fuel Economy of Refinements in Engine Design

Views of a British engineer specializing in carburetion, in regard to numerous factors of design which affect performance and economy. Pulsating flow, valve timing, scavenging, manifold design, combustion chamber shape and carbureter characteristics among items considered.

By L. Mantell*

THE factors which determine fuel economy in so far as they are at present understood in England, can be grouped under three general heads:

(1) The production of a well-disintegrated spray intimately mixed with air, a mixture not in constant proportions but varying as regards its air-gasoline ratio, according to the characteristic of the engine;

(2) The reduction to a minimum of all depositing agencies which may act upon the spray in its passage from the carbureter to the engine; and

(3) A design of combustion head and placement of valves which will permit the highest possible charge turbulence, and maintain, by correct distribution of heat, the utmost uniformity of temperature throughout the mass of burning charge.

Were the current of air through the carbureter of a perfectly steady nature, such as would be produced by a rotary blower and the flow of charge in all parts of the induction pipe absolutely uni-directional it is probable that carbureter adjustment would be mathematically determinable; but the current is, of course, far from regular and by no means uni-directional, hence the wide discrepancies shown by comparing the carbureter adjustments and thermal efficiencies of different engines of the same capacity.

Current Pulsations

Consider first the question of current pulsations. These are produced by exhaust back pressure, inlet back pressure, and by some other cause which is at present a little obscure, but appears to come either from the shock imparted to the moving current of gas by the closing inlet valve, or by certain shapes and areas of the induction manifold which intensify vibrations.

The predisposing causes of exhaust back pressure will be evident if we consider the progress of the exhaust stroke in the case of an ordinary touring engine with a muffler fitted. If the latter is very well designed with a view to the avoidance of back pressure and placed well to the rear where the exhaust velocity has decreased to a minimum owing to the contractive effects of cooling, its obstructive tendencies may be negligible, and at exhaust top center the residual pressure in the combustion head may be almost at atmosphere. But in the great majority of cases an engine so fitted will have a certain degree of positive pressure in the head at top center and therefore if the valve is closed at this point and the inlet opened very shortly after, it is most probable that a slight shock of back pressure will be communicated to

the entering column of charge before the action of the piston corrects its direction. Apart from this there will be in such circumstances an increased ratio of carbon dioxide present to vitiate the incoming gas and thus retard the rate of combustion. For this reason, among others, it is common practice in England to close the valve a few degrees late, generally about 10 or 12 deg.

Certain designers, however, favor the top center position for the reason that the small proportion of carbon dioxide present has the effect of softening the shock of the combustion, and imparting in this way an increased smoothness to the running of the engine. In the opinion of the writer this is fallacious practice, for the reason that an engine so timed must be very well designed as regards the shape of the combustion head and the size and disposition of the valves, otherwise, even with a thoroughly open and free exhaust system a slight vibratory blow-back is almost sure to set in.

It is found that engines timed in this manner invariably require unduly small choke areas in order to obtain good consumption, the reason apparently being that without an increased induction depression to damp out the tendency to blow-back this symptom develops to the detriment of a requisitely fine degree of spray suspension. It must be remembered that a pulsating series of gas-shocks has the effect of coalescing the finer particles of fuel into coarser globules which enter the combustion head insufficiently mixed with oxygen to burn at a useful speed, and are therefore ejected at the exhaust in a cracked or partially burned state, where their presence can be detected and measured by analysis of the exhaust gases.

Apart from this, an engine originally timed to close its exhausts on top center will do so before top center after a certain amount of cam wear and tappet side play has set in. Also, there is no margin left for such exigencies as a dirty silencer, or late or weak ignition. It seems, therefore, much sounder practice to close this valve at an appreciable distance over the top center.

The object in giving the inlet valve a closing lag is to cope with the wire drawing to which the induction current is subjected, and thus permit time for a more complete charge to enter the cylinder. If the valve is held open beyond the point where the minus pressure in the cylinder, which obtains during the induction stroke rises to normal, the action of the ascending piston will surely impart a series of shocks to the incoming current.

It might appear that the retarding effects of the throttle when running at a moderate pace and load would obviate any chance of a shock being imparted to the current in this way. It seems, however, to be the case

*The author is connected with the Solex Carbureter Co.

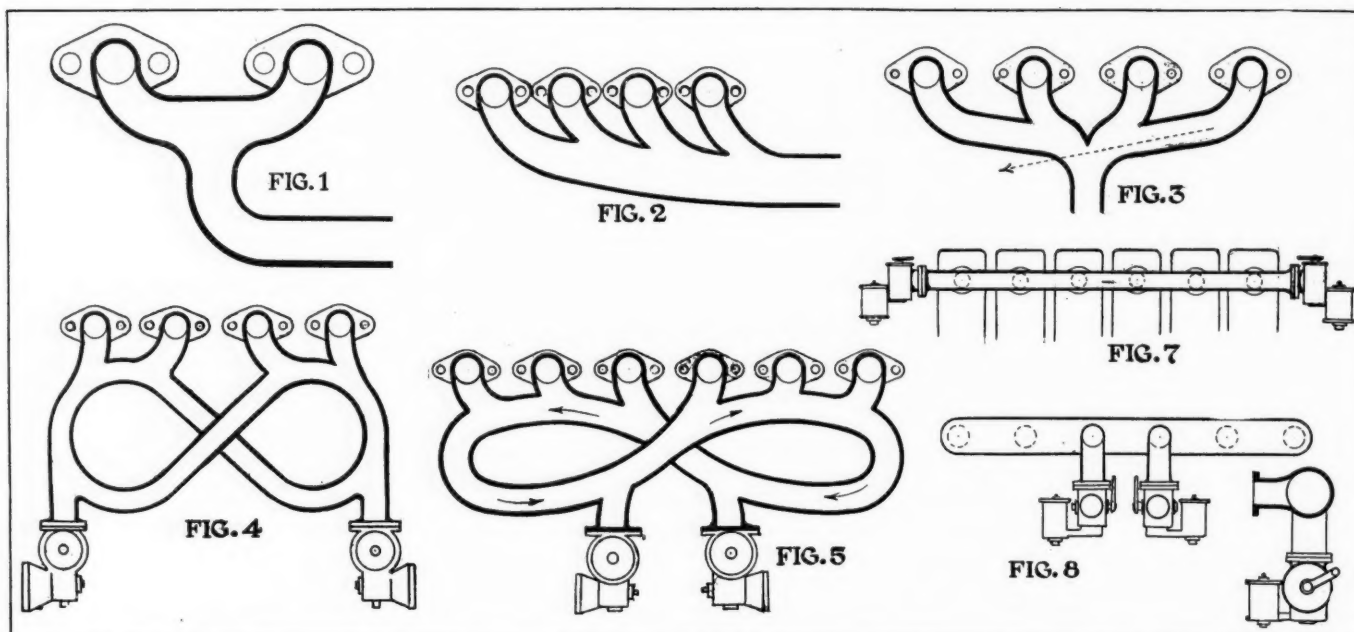


Fig. 1—Example of two-port T pattern exhaust manifold. Fig. 2—A well-designed four-port exhaust manifold. Fig. 3—A slightly defective Y pipe. Note the direction part of each discharge tends to take in its passage to the main pipe. Fig. 4—Unidirectional flow pipe for four-cylinder engine using two carburetors. Fig. 5—Unidirectional flow pipe for six-cylinder engine with two carburetors. Fig. 6—Straight induction pipe with carburetor at each end. Fig. 7—Side view of induction pipe with carburetors opposite ports 3 and 4. Fig. 8—End view of induction pipe with carburetors opposite ports 3 and 4.

that an unduly late inlet closing point, although in many instances it undoubtedly increases power at high speed, has a bad effect on consumption when running at low throttle positions.

The prevailing tendency among English designers is to close this valve rather too late, and the writer has seen many instances in which considerable improvement in economy has been effected by regrinding the cam so as to give less closing lag. It must be admitted, however, that cases are occasionally noted when quite good economy is obtained with timings that in an average engine would certainly cause waste.

From about 40 to 45 deg. late seems to be a favorite position for closing the inlet in English cars, but the writer has seen many cases in which this lag has been reduced to half that amount without appreciably impairing the power and with a considerable increase in economy. In slow speed truck engines particularly is this true.

There is more than one engine on the British market, which, in other respects well designed, is spoiled by an undue inlet closing lag. The simplest remedy, which is only in the nature of a compromise, is to use a small choke, or as the case may be—a heavy spring or gravity valve, where a carburetor of the constant vacuum type is employed.

Inertia Factors

If the exhaust valve still remains open too late the column of moving gas in the exhaust tract sometimes causes a minus pressure in the clearance space. Advantage may be taken of this by opening the inlet valve at the point where the minus pressure sets in and thus permit the head to be flushed and scavenged, while the piston is, comparatively speaking, at rest. An overlap of this nature occasions waste owing to the charge from the inlet tract escaping via the exhaust when the overlap is carried to excess, but a limited amount of overlap is economically advantageous.

Since the velocity of the exhaust column affects greatly the completeness of the scavenging, it would appear that the position of the opening point of each exhaust

valve in a four-cylinder engine must control to an appreciable extent the value of the auto-scavenging vacuum of the previous cylinder in order of firing. A careful study of the variations in carburetor adjustments called for by alterations in the opening points of the exhaust would appear to show that the fixing of this point is very potent, not upon its own cylinder, but evidently upon the preceding one.

Exhaust Manifold Design

The manifold has a considerable effect upon pulsations, and the design and shape of the exhaust passages and manifold are important.

While most engine makers are fully aware of the necessity for providing the utmost freedom and constancy of direction where high efficiency engines are concerned, it would seem from the frequency with which errors occur in the design of these parts that many British manufacturers are under a considerable misapprehension as to the extent to which this rule applies in the case of ordinary touring car engines.

While, for instance it is neither necessary nor desirable that a touring engine should be fitted with a long and open main pipe into which the port leads are very gradually swept by wide bends, it is, on the other hand, going to be quite the opposite extreme to cast the manifold integral with the cylinder block, and add to that offence by placing it in such a manner in relation to the valve pockets that the gases on emerging therefrom are bent sharply at a right angle.

The effects, of course, are two-fold: An incurably pulsating current owing to exhaust obstruction and, in many cases, overheating.

Few engines are now designed with cast-in exhaust manifolds, but, in their place another form of pipe seems to be attaining a certain popularity, namely, the "T" pattern, in which the main pipe is placed in the center and fed by leads from each end. While this is not so grossly undesirable as the enclosed variety it cannot be commended as sound practice.

In the type of pipe shown in Fig. 1, with which a few engines are fitted, consider the alternate firing orders—

1-2-4-3 and 1-3-4-2. In either of these cases two successive explosions will always come down the right and left branches respectively and interference will occur.

The first effect of this will be that the obstructed pair will be more vitiated by residual carbon dioxide and their fuel supplies arrive in a coarser and less combustible state than the other pair, and the final effect will be that one pair will require a richer mixture than the other.

The leads from all exhaust valves, both inside and outside the cylinder casting, should be of identical dimensions and internal shape and should enter the main tract or merge with each other at an acute angle, the apex of which points in the direction in which the gases are moving, as in Fig. 2. By this means only can identical degrees of scavenging be assured, assuming similar valve timings.

Now, while the "T" pipe is not good practice, the same is not necessarily the case with the "Y" pipe; especially a 4-port "Y" pipe. Considerable care, however, must be exercised in designing the curves. Note, for example, Fig. 3. It will be obvious that absence of interference is by no means assured here. The port leads enter the respective branches at the desired angle, but the angular relations in which the two branches themselves stand are clearly too obtuse, and interference as indicated by the dotted line will in all probability set in.

It would seem that a two-port arrangement is wholly inadvisable, for, in almost every instance observed there is evidence of interference according to the firing order as above; and a careful inspection of the single port system will readily show how this can well be so. At the critical scavenging point of one cylinder comprising the pair, the succeeding one in the order of firing is almost at full blast, and in a comparatively restricted area when no particular direction has yet been imparted to the exhaust gases. It is inconceivable that interference will not take place. All experiments go to show that this is one thing to be guarded against.

The highest grade of English engines is provided with external manifolds of the general design shown in Fig. 2, or alternatively on the lines of a deep Y, which is equivalent from a functional standpoint.

Inlet Manifolds

With regard to the inlet design, it must be admitted that British makers are by no means happy, especially where six-cylinder engines are concerned.

The main functions of an induction system are to provide by suitable dimensioning a maximum and if possible a constant peak velocity at all points from the carburetor to the valves, consistent with the maintenance of volumetric efficiency, having regard to the horsepower curve required, and to avoid corners, pockets and any local enlargements that will produce depositing whirls and eddies.

Where four and six port engines are concerned and appearance and expense no object, the unidirectional "figure 8" manifold (Figs. 4 and 5) with two carburetors seems to be as near perfection as any that have been tried, gas shock being apparently reduced to a minimum and the utmost steadiness of current assured. But cost, appearance and mechanical inconvenience place these designs quite outside the pale of the ordinary production job. We are obliged, therefore, to try to obtain similar results by less cumbersome and expensive means and must choose between an external manifold of simple design and the internally cast induction system.

In either case experience shows that the prime necessity is constancy of area. Where angles or bends are employed, they should be so designed as to impose an

identical number of deviations of the same angles between the carburetor and each inlet valve. This is easy enough to do in the case of a four-cylinder engine by means of the ordinary "T" or "Y" pipe, and it would seem that there is little difference in the respective efficiencies of these designs provided one does not ignore the internal disposition of the valves in relation to the port, in engines where there are two cylinders per port. In such cases it is desirable to avoid a large space of nondescript shape inside the port, for, although located within the cylinder casting and subject to the surrounding heat, this space is virtually still the induction pipe and, with the present low volatility fuel, deposition can easily take place.

Again, it is generally found to be better where a wide "Y" pipe is used, to straighten up the ends before approaching the ports, for the reason that otherwise deflection can easily occur at high speeds, and the outer pair of valves receive by centrifugal action more than their due share of the heavier parts of the charge.

Surface of Manifold Interiors

It is usually considered that internal roughness of the induction tract is inadvisable unless the surface is well heated, as in the case of the cast-in manifold, the reason being that the rate of movement of that portion of the charge adjacent to the rough walls is reduced by skin friction and a depositing tendency set up.

Certain research authorities are said to have found that the section of moving charge illustrated graphically may be represented by a parabola when moving at a comparatively low rate; as the velocity of the moving mass increases the top becomes flattened into a series of small parabolas until, at maximum velocity, these span the distance from wall to wall, with the exception of a small annuli near the actual surface of the tract, which is always at low speed (Fig. 6). The richness of the mixture is said to be such that the minimum of fuel is in the center and the maximum at the outside.

It appears from actual experiment that with the cast-in manifold the heat of the surroundings neutralizes to a great extent the depositing effects of surface roughness, for, in respect to economy, there is little difference to be noted.

For high volumetric efficiency purposes, however, there seems little doubt that the external pipe is the better. Hot surroundings are undesirable in this case owing to the volumetric losses which accompany a heated charge and conversely a smooth interior is essential.

Six-Cylinder Gas Distribution

One of the greatest troubles in the design of induction systems is the question of distribution in the six-cylinder engine. Ever since the inception of this design this has been a much debated point. The principle of employing two carburetors on high-grade productions seems to have more or less solved the problem.

Strangely enough a perfectly straight pipe with a horizontal carburetor at each end (Fig. 7) has been found to answer very well indeed on certain engines despite the apparently well established theory that unidirectional flow is desirable. On the other hand, at least one well-known French maker employs very successfully a straight pipe with two vertical carburetors feeding into it opposite ports No. 3 and No. 4 (see Fig. 8). An over-rich mixture to these cylinders and starving of the end pair with such an arrangement would be expected, but in practice it seems to work well. No doubt the troubles foreseen for the middle pair are prevented by the spreading effect of the right-angled bend imposed upon the gases on leaving the carburetor; but it is difficult to

see why the rebound and consequent gas shock at the ends does not play havoc with the distribution.

The only thing that we seem to have established with certainty is the futility of having an acute angled supply to one port, or pair of ports and an obtuse bend leading to the others. Apart from this it is painfully evident that we have still much to learn regarding the subject of distribution, and it is needless to emphasize the importance of this matter, for bad distribution must inevitably cause waste.

Combustion Chamber Design

The relation of combustion chamber design to thermal efficiency must receive attention. The desirability of smallest possible metallic area exposed to the flame and of reducing the heat absorption to a minimum by machining and polishing of the head are well understood, but some of the more recent researches into the question of charge turbulence and detonation, which have lately been occupying the attention of European investigators cannot fail to be of interest, as they have a great bearing on fuel economy.

It has long been obvious that in order to permit of the pressure developing at a suitable rate to exercise a useful driving action on the piston crown the propagation of flame throughout the charge must take place at a considerable speed, and the original impression was that it increased by a definite and high rate of acceleration. It is now established, however, that the rate of flame travel in a still charge is a fixed figure and is in the neighborhood of $7\frac{1}{2}$ ft. per sec.

The establishment of this fact led to further investigations, with the result that the spread of flame is now known to be solely dependent upon the mechanical action of the whirling charge which carries it throughout the mass, and that the efficiency of the combustion is therefore directly concerned with the speed of the whirling. The effect of this discovery was, of course, to throw a considerable light upon many points in connection with combustion head and valve design which had previously been debatable, and in some cases completely misunderstood. The superiority of the overhead valve is now seen to be in great measure due to the increased turbulence permitted by the more symmetrical shape of the head.

Detonation

So far as our present knowledge goes detonation appears to be produced as follows: While at normal temperatures and pressures the progression of the flame of combustion throughout a mass of charge will be at a speed which depends upon the rate at which it is mechanically carried by turbulence, there is a top limit to the temperature at which this gradual propagation can continue. When, owing to various causes this critical point is exceeded, the mass, or portions of the mass, so raised will spontaneously ignite throughout its bulk, giving rise to an exceedingly sudden and very high pressure, which is of no driving value whatever and represents so much wasted fuel. In its more advanced stages this action is so momentary and violent that it imparts practically a hammer blow to the cylinder, causing molecular movements in the wall which are popularly described as "knocking." By means of high speed cinematography the cylinder can actually be seen to "breathe" under the influence of violent knocking and only the very momentary nature of the excessive pressure saves it from disruption.

Having regard to the predisposing cause of this trouble, namely, heat, it is not hard to follow the stages of its development. As the first portions of the charge are

burnt at their normal rate the resultant pressure is communicated to the residue, raising its temperature. Should the original temperature of the unburnt part be already unduly high owing to the heat of its surroundings it is easy to realize that its critical point can readily be reached, and it will further be evident that the higher the original temperature of the gas the greater will be the proportion of the residual bulk that will detonate.

Keeping in mind these two primary facts in regard to charge turbulence and detonation, a very interesting line of thought is opened, for it will be evident that the shape of the combustion head has a marked effect on both. The more rapidly we can whirl the charge the more homogeneous will be its temperature, and from this it naturally follows that as the speed of turbulence depends largely upon the emplacement of the valves and the symmetry of the head, the presence of valve pockets, unless carefully placed in relation to the main chamber, will act as local hot spots and stagnant areas, the contents of which will probably attain a degree of heat well in excess of the mean temperature of the charge. In practice this theory is well borne out, for it is known that the overhead valved engine is much less prone to knock than either the "T" or the "L" headed types, and that sleeve valve engines are particularly free from this trouble.

Equal Distribution of Heat

The lesson which is learned from the establishment of these principles is that the prime objective is not so much keeping down the mean temperature as distributing the heat equally over all parts of the combustion head. It is much more difficult to do this in an L or a T head than in an overhead engine, and conversely it is easier to accomplish in a sleeve valve type than on either of the others.

It would appear from experiments that the exhaust valve itself is the principal cause of local overheating. A certain racing "L" head engine having a compression ratio approximately 7 to 1, once used at Brooklands, could be driven to a standstill on a hill without changing down and with scarcely a sign of knocking in evidence. The secret of its ability to perform this remarkable feat was that its exhaust valve guides were drilled with a small channel through which a fine spray of water was directed on the under side of the valve, which was thus kept cool. Such an arrangement would, of course, be quite useless for standard production work, but its effect on the functioning shows very clearly how great is the necessity for avoiding local hot areas. In those days the principles of detonation were unknown and the success of the scheme was erroneously attributed to the prevention of pre-ignition which, as we now know, is quite a different thing.

What is the most economical shape of combustion chamber from the fuel consumption standpoint? There can be little doubt as to the reply, namely, that with overhead valves. Here we have a combination of all the desirabilities—minimum of exposed surface, maximum reduction of local hot spots, the most direct entrance and exit for the gases, the most favorable shape for charge whirling, no possibility of stagnant charge areas, and last, but by no means least, the capacity in virtue of the above advantages to use a much higher compression than would be possible in the "T" and "L" heads without detonation losses, for it must be remembered that thermal efficiency rises directly with the compression ratio provided partial detonation does not set in.

There is much misapprehension in England regarding the utility of high compression.

An L or T head engine on which the compression can be successfully raised must be so dimensioned that, (1) the piston does not rise appreciably above the floor of the valve pockets, (2) and that there is still a suitable space in which the charge may whirl. The isolation of a large part of the charge in a valve pocket which would result were the piston brought very near the roof of the combustion head is obviously undesirable.

While the functional superiority of the overhead design is recognized it is well to see in what way the L head as such can be improved.

Detachable Cylinder Heads

One of the most useful innovations in this direction originally introduced in America, and subsequently adopted in England, is the separate combustion head.

Apart from its convenience from a production point of view, this principle has certain functional advantages which justify its development; (1) it enables the inside of the head to be machined more easily, (2) it permits of better heat distribution owing to the absence of the uncooled masses of metal forming the valve caps and (3) it allows a better choice of places in which to put the spark plug.

The advantages of (1) have already been dealt with. As to (2) it is occasionally argued that the valve cap masses are merely eliminated at the expense of the introduction of other masses. While this is perfectly true it must be remembered that other masses, for example, the thickenings necessary for the anchorage of the head, are much less unfavorably placed as regards their effect in producing local hot areas, which is, of course, the chief objection to their presence. The position of the plug is also important. Its position determines to a great extent the direction of the flame whirl. There is little that can be done as regards positioning on a theoretical basis. By using trial and error methods in the individual case it will be found that in some locations detonation is much less in evidence than in others.

The advantages of reducing tendencies to detonation are important. It is not the mere fact of freedom from knocking which counts, although that in itself is a great acquisition from a standpoint of comfortable driving. It is rather the ability to employ greater compressions that matters. Compression is one of the most potent factors in economy, provided it can be raised without causing detonation.

Carburetion

It remains now to deal with the question of producing a proper charge. There are remarkably few engine designers in England who ever attempt to understand the seemingly inconsequential manner in which carbureters demand extremely varied choke areas, induction depression values and air-gasoline orifice ratios.

In France the position taken up by designers is much more logical than in England with regard to the question of carburetion. There it has recently become the custom with many manufacturers when preparing the drawings for a new model, to consult carbureter specialists on those points of design which are directly concerned with carburetion; for example, the induction and exhaust system, the valve timing and certain details concerning the shape of the combustion chamber are submitted for criticism. But in England, with few exceptions, the design of these parts is undertaken without any reference to specialists on this subject, with the result that many engines fall short of the thermal efficiency figure which is merited by their design in other respects. There exists an erroneous impression that the carbureter is in the nature of an independent accessory,

instead of being one of the most important details of the engine and intimately interconnected functionally with those parts which the designer is apt to regard as purely mechanical or productional propositions.

Disintegration v. Vaporization

To analyze the requirements of the engine and consider the respects in which an average carbureter is capable of satisfying them, consider first the state in which the fuel must be delivered. The prime requisite here is intimate admixture with oxygen, hence the necessity for fine disintegration. Could this be carried to a sufficiently advanced state, heat would be neither advantageous nor desirable, for the thermal efficiency of an engine depends upon the amount of oxygen that can be usefully employed—that is, at the necessary speed with a minimum of free or partially cracked fuel in the exhaust. Assuming, therefore, that the fuel can be sufficiently disintegrated by purely mechanical means the presence of heat would be undesirable in that it must cause volumetric losses owing to (1) charge rarefaction and (2) displacement of oxygen, which must follow upon a partial vaporization of the fuel, for the smallest possible space is obviously occupied by disintegrated but unvaporized fuel.

While these conditions can be approached at very high induction velocities combined with an engine regulation and design which give the utmost freedom from depositing pulsations, it is clearly impossible to fulfill them at low velocities. We must, therefore, fall back on heating, which is the only alternative measure.

The degree of heat is of considerable importance, for whereas too low a temperature will permit of the fuel entering the cylinder in an insufficiently pulverized state to insure that it is completely and quickly burnt, too high a temperature will cause unnecessary rarefaction.

Careful experiment shows that the essential degree of heat varies considerably in different engines and conditions of carburetion; but it would seem that the heat applied should be such as to give the charge a final temperature of 90 to 100 deg. Fahr.—that is, in the induction pipe, after the latent heat losses have already taken place.

Apart from the question of induction heat the general engine temperature itself has a considerable effect upon economy; an over-cooled engine is well known to be a great fuel waster.

There is a critical engine temperature at which the thermal efficiency is at its best, and for economic results a means should be provided to enable this point to be maintained, for example radiator shutters or thermostatic control of the water circulation.

Heating the Carbureter System

As for heating the carbureter system there are two ways of accomplishing this adopted by British designers, namely, by hot air obtained from an exhaust muffle and by jacketing the induction pipe in cases where the manifold is external.

The latter method is generally considered the more accurate, for the two reasons that (1) there are less volumetric losses and (2) the degree of heat is more constant, for, in this connection, it must be remembered that the exhaust manifold is very greatly influenced by such factors as load, spark advance and mixture strength. Admittedly, water circulation is also affected by these irregularities but to a relatively slight degree.

The next matter for attention is the actual production of spray, and here carbureters fall very short of practical requirements. While at high engine speeds all may be well, in touring practice the wide-open throttle con-

dition to which this figure applies is only occasionally attained; medium and low-throttle positions are much more frequently used, and in these conditions of driving the carbureter is found wanting, first for the reason that its spray-producing qualities are not constant throughout the throttle curve, and second because it is in the majority of cases quite accidental if the instrument suits the characteristic of the engine.

The point of maximum velocity is at the opening edge of the throttle until such times as its progressively increasing area becomes equal to or greater than the choke area, in the case of open carbureters with a variable vacuum. The main jet situated in the choke is not operating to its fullest advantage until the throttle is well opened, while the auxiliary jet, which is placed either at the edge of the butterfly valve or in the case of a barrel throttle, generally near the center of the barrel, is not at any time the point of maximum velocity.

When a butterfly throttle is used part of the air goes round the other side of the disk, thus reducing the local velocity; while in the barrel type there is a high velocity point at its top and bottom closing edges, but comparative stillness in the intermediate area in which the jet is placed.

The best design would incorporate a variable venturi with a perfectly controlled jet in its waist. This presents very great mechanical difficulties, however, for the jet must be dually controlled, that is, it must be mechanically variable to conform exactly to the extreme variations of the velocity in the venturi, and must also be controlled for automatic correction to deal with variable loads and speeds at constant throttle positions.

Carbureter Characteristics

It is, however, in respect of their "characteristic" that carbureters are principally found wanting. A constant mixture at all speeds is not desired. Note the diagram (Fig. 10) showing an average throttle curve chart. The air-gasoline ratios are shown on the left and the degrees of throttle openings at the top.

Taking now 15.3 to 1 as the perfect combustion ratio it will be seen that for easy starting and slow running the fuel proportion is a little high, but as the throttle opens a weak area is shown from about one-eighth to three-eighths opening, namely, in the average driving position. For purposes of acceleration, however, which is usually done at half to three-quarter throttle, the mixture is chemically correct; but for extreme power, at the last fraction of opening, the proportion of fuel is increased about 25 per cent.

The necessity for the last-mentioned enrichment arises from the fact that a chemically perfect ratio is not the most powerful. Owing to the specific heat changes at the high temperatures of combustion it is found desirable to increase the percentage of fuel by about 25 in order to keep down the flame temperature and thus gain a few per cent of extra power, not through improved combustion, but due to cooling effect of the latent heat of the additional fuel. It will be obvious that this addition must only be made at the very last fraction of opening and thus be used solely for emergency purposes, where extreme power is desired.

Apart from the fact that there is no carbureter on the English market in which means are provided to shape the throttle characteristic as desired, that of the engine is itself a variable quantity and complicates still further efforts to balance the two curves.

The difference in the inertia values of air and gasoline is important. The former being light will readily respond to varied impulses, but the latter because of its much greater weight will follow them less readily. Con-

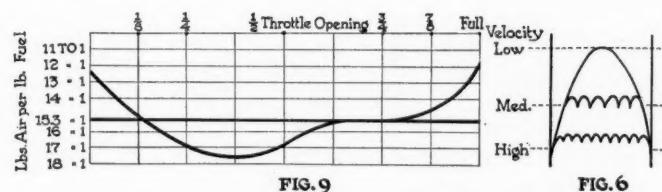


Fig. 6—Graphic section of induction current, showing effect of increased velocity. Fig. 9—Diagram showing the throttle mixture curve suitable for an average touring car engine

sequently, the more pulsating the current the larger is the jet or, as the case may be, the smaller the choke necessary to give a stated mixture.

If, therefore, we have a well-considered valve timing, strong valve springs to prevent lag and bounce, and an intelligently designed induction and exhaust system, we can count on a fairly straight engine characteristic. But where there is any tendency to variations in the nature of the periodic impulses troubles commence.

An engine designed for very high output at high speed has exhaust inertia, a big overlap of inlet and exhaust valves, and a steady current which will advantageously take a large choke results, but at low engine speeds there will normally be insufficient spraying velocity at the main jet, consequently a flat area will develop here unless the throttle is placed near enough to the choke to take over its duties to an extent pending the attainment of sufficient air speed in the latter to permit of its functioning unassisted. Lowering the throttle would cure matters were it feasible.

On the other hand, if the throttle is, as is frequently the case, too near to the choke, the proximity of its opening edge to the jet will cause the latter to function too soon and give rise to a rich area in the throttle curve at a point of partial opening which is difficult to eliminate.

The correction cannot be done at the auxiliary jet in either of these cases, for this would, in turn, upset the curve at small throttle openings. One solution is to have a main jet of some type in which the correction does not start until this point is passed, and this is difficult to secure in the case of constant vacuum carbureters where the jet is automatically controlled by a taper needle set in the gravity valve and moving therewith.

Consider next the case of the engine in which the exhausts close early, but which have springs of sufficient lightness to allow the valves to develop a progressive lag as the speed increases, and thus eventually close by accident where they should have closed by design. It will be quite evident that the result of such an unintentional variation in the valve timing will be to provide a jerky current at low speeds which suddenly steadies as the automatic closing lag sets in.

Imagine a set of circumstances such that the current will be steady at low speeds and gradually develop periodic vibrations as the speed rises. A badly designed exhaust manifold, for example, will have this effect, or a combustion head so designed that there is a great predisposition to knocking and, therefore, a late ignition is essential. The inevitable effect of a late spark is that the explosion will be slow in developing and the residual pressure will, therefore, become progressively higher as the speed mounts up, and from this will naturally follow a periodic vibration which will rise in intensity directly as the residual pressure. In this case, instead of requiring mixture correction, we need a gradual enrichment to balance the inertia disturbances offered to the gasoline column in the spraying member, and this, of course, is not a condition normally cared for by any standard carbureter.

It will thus be evident that a large number of different engine characteristic curves can readily be arrived at by various combinations of defective details of engine design; that is, in respect of induction and exhaust tract and combustion head shapes, valve spring strengths, cam contour, etc. If the different proportions of mixture demanded by the engine with increasing speeds happen to be within the capacity of the correction device of the carbureter, all may be well; but otherwise the instrument is called unsuitable, whereas the real facts frequently are that the engine designer, through lack of knowledge of the more intricate side of engine functioning, has imposed a set of conditions which no ordinary carbureter could possibly be expected to deal with in a satisfactory manner.

Ignition Timing

Ignition is another question which seems to be insufficiently studied; that is, in its relationship to the carbureter. The average engine should take at medium speeds an advance of about 30 deg., assuming a normal magneto or any other form of ignition which maintains its spark intensity at high speeds, and which does not develop a progressive lag as the speed increases. In badly designed combustion chambers, however, where there is a great tendency to detonation on increasing the load, the ignition timing is often made unduly late to prevent knocking. This always leads to complications.

for residual pressure is almost sure to develop above a certain engine speed, assuming a large throttle opening and load, and thus the carbureter becomes the scapegoat for faults which are directly due to some fundamental error in design and not attributable to this instrument at all.

The measurement of fuel consumed per brake horsepower-hour as determined by bench tests should be conducted both on a basis of load variation and throttle variation at constant and at varying loads. In this way defective characteristics can be located and traced where an ordinary load curve would disclose nothing.

The average modern instrument of reputable design is quite capable of dealing with all ordinary engine characteristics if correctly adjusted. When it fails to do so it would be well if engine designers would consider the probability that all is not well with the engine and investigate accordingly, instead of unequivocally writing off the carbureter as defective and searching for one which is able to deal with abnormalities. For, as can readily be appreciated from the above examples of abnormal characteristics, a carbureter which will suit such an engine where others of repute fail will, in many cases, simply mean that, far from being a first-grade instrument, it is in actuality quite defective from a point of view of standard requirements, and eventual troubles are probably in store for an engine passed out on the former assumption.

A Viscosity Temperature Chart

A CHART for determining the viscosity temperature relation of various mineral oils is given in the accompanying cut. By the use of this chart it is possible, according to *Lubrication* in which the chart is published, to determine, if the viscosity at two points on the curve are known, the viscosity at any other point on the temperature scale, since for all mineral oils the lines on the chart are straight, at least above the temperature of the cloud test.

Oils A, B, C, D, E and F, which are all straight-run distillates from the same base crude and differ but little in gravity, have lines which are almost parallel. Oils N, P and U, which differ considerably in gravity, being from a different crude, have lines of different slope.

Below the temperature of the cloud test, the viscosity rises rapidly, due to the precipitation of the paraffine, and the curve turns upward. In well-refined naphthene base oils, A to I inclusive, there is practically no paraffine content,

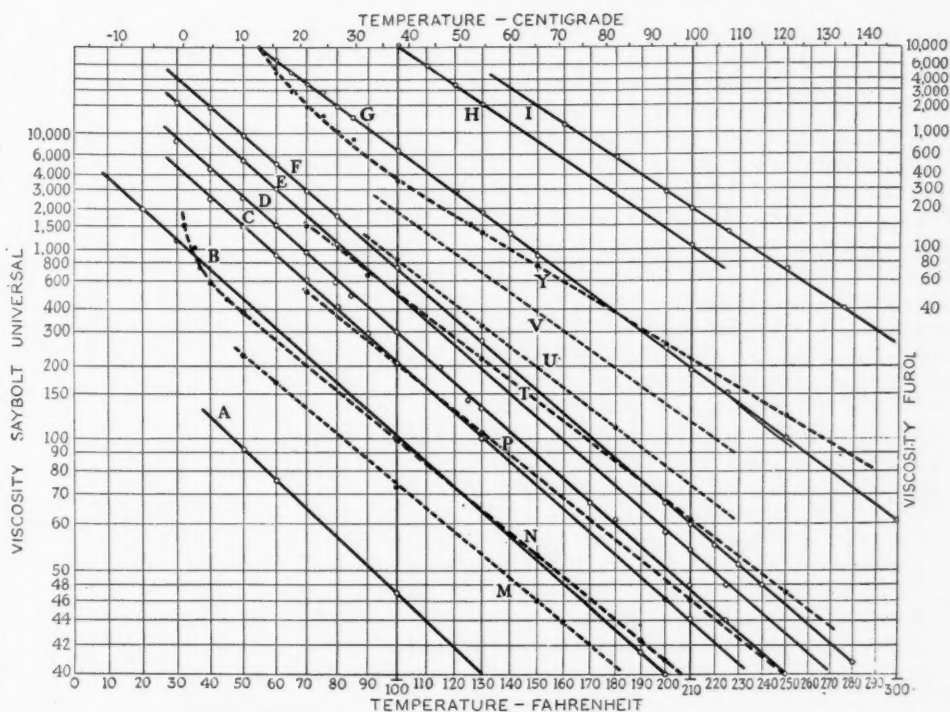


Chart showing relation between viscosity and temperature of various mineral lubricating oils

hence it will be noted that there is no deviation from the straight line.

A RECENT U. S. Consular Report makes the following statement as regards motorcycles in Australia:

"The average price of a motorcycle at present in Melbourne is \$826. In 1911 it was \$315, and in 1914, \$365.

It appears necessary for every motorcycle to have a side car, which costs \$207. Apparently it is now cheaper to purchase a second-hand motor car than a fully equipped motorcycle."

How an Effective Labor Policy Has Increased Production

The most important factors of human relationships in industry are those which cannot be photographed or charted. The successful labor policy discussed has recognized that fundamental fact and has proceeded along sound production lines. A carefully planned wage system is a feature.

By Norman G. Shidle

THE journalist often speaks of going out to "dig up" a story. The expression indicates that he must make special effort and inquiry to locate the material desired. It often happens that the story most difficult to "dig up" is the best story on the particular subject. This is specially true in the field of labor and industrial relations. The story that is easiest to find and easiest to write is that which deals with definite schemes and plans, that contains formulas, brass bands, pig roasts and other perfectly tangible things, pictures of which can be shown and diagrams drawn.

But the difficulty with such stories is that, because of these very tangible characteristics, they deal with the superficial rather than the fundamental factors of human relationships in industry. The fundamental factors are intangible to a large extent; they deal with the feelings and actions of individuals and the reasons for those actions and desires. The factory in which the management has caught the vision of these fundamentals and in which the labor policy is being worked out along basic lines may have few surface indications of a "story" at all. And even when the facts are discovered it is no easy task to reduce to common terms the psychological and intangible factors involved.

Since such factors are fundamental, however, and are essential to the understanding and operation of any labor policy, a discussion of a particular plant in which definite progress has been made is always of value. Through a study of various individual instances, each of which is developing along constructive and permanently progressive lines, it may be possible to build up a philosophy and a series of principles for practical application which will solve the labor problem for those making the study.

The methods in use at the Autocar plant are worth attention from this point of view. The interesting feature of the work at this plant is not so much the detailed working out of methods as the excellent results achieved through a working out of general ideas based upon sound fundamentals. The methods revolve around several basic factors, the chief of which may be listed as follows:

1. A carefully planned, installed, and operated method of wage payments
2. A successful promotion policy
3. A definite effort to develop leaders
4. Some study of monotony work and attempt to reduce its detrimental effect upon the individual
5. A broad vision of the labor problem in general and an intelligent conception of the relative importance of the various factors involved
6. A realization of the necessity for slow growth in the development of a labor policy.

7. Belief that ultimate progress in industrial relations depends upon an understanding and proper handling of the individual.

Wage Payments

The striking thing about the system of wage payments in use at this plant is the care with which it was installed. The system itself is a form of bonus payment similar to that often found elsewhere. The payment of bonus rests upon a time and piece basis. The man is paid a certain base rate. Then a task is set. When the man accomplishes 90 per cent of that task his bonus begins. The bonus then increases in certain definite proportions as the production of the man increases.

This system, it is obvious, rests fundamentally upon the establishment of accurate times for the performance of the various operations. This company recognized the great trouble which might occur from the setting of inaccurate task rates. It realized that every change in rate is a cause for suspicion in the minds of the workmen. For this reason it went about the setting of task rates very slowly and very carefully.

The management decided some two or three years before installing this bonus system that the system was to be used. Then work was begun in gathering data, making tests and experiments, correlating material and checking up results. In other words, every reasonable precaution was taken to make certain that all the task rates set should be accurate.

The man in charge of task setting and bonus work is a former shop man in whom have been developed the qualities other than mechanical necessary for such work. This man had worked in the Autocar shop for years and knew practically all of the men as friends before taking up this work. The men liked him and had confidence in his fairness and honesty.

The attitude of the workers toward the man in charge of rate setting and bonus adjustment is always, of course, an important factor in determining the success or failure of any such plan.

When the task rates were finally ready for installation, the bonus system was started in two departments only. The men were told that the sky was the limit on production, and that the task rates would not be increased unless there was a change in design or machine equipment.

For some time only a slight production increase was noticeable. The men had seen systems of this kind operate and had heard of their operation in other plants. They knew that when a statement of this kind was made it did not always mean exactly what it said. They knew

of many instances in which the piece rates had been cut or task rates increased, regardless of what was said at the beginning. So they were cautious in advancing production and were afraid to earn a large bonus.

The management said nothing and made no attempt to drive them, but reiterated its statement that task rates would not be increased. Gradually production increased. Little by little the men began to earn more bonus. Finally it became evident to the men that the management honestly meant what it said and they "went to it." The experience of the men in these first two departments spread to other parts of the plant, of course, and the installation of the system in those other departments was a comparatively simple matter.

The long period of preparation that had been gone through, however, should be recognized as an important factor in the success of the plan. Careless and hastily set piece or task rates have probably been the real cause of more labor trouble than any other single factor. In this plant it took a long while for the management to gather and correlate the data which they considered essential to the proper establishment of rates. But the result has been a permanent benefit to both management and men. This is simply another illustration of the fact that it is not so much the system as the method and spirit in which it is installed and operated that is the chief factor in making for success or failure.

Promotion Policy

When men are promoted from within the organization a desire to advance is likely to be common among the employees. Such a policy has been pursued at this plant. Practically all of the foremen have been developed from among the workmen, while the plant superintendent, as well as the production manager, was formerly a workman in this shop. The advantage of this policy is that it presents a definite promise to every workman that he will have an opportunity to rise through increased effort.

There are dangers, of course, to a promiscuous adoption of the policy of promotion from within. The promotions must be made with discrimination and the selection of leaders be on the basis of merit and not favoritism. When a man who has been unpopular as a workman is made foreman there is trouble in store for that department; far more trouble than if an outsider were brought in.

Taken as a general thing, however, the policy of promotion from within is an excellent one, and will go far toward obtaining better spirit among the workmen.

To develop leaders from within the plant, however, is not always an easy task. "There are a few natural leaders," says H. A. Butler, superintendent of the Auto-car plant, "but most leaders have to be developed. There are not nearly enough of the natural leaders to fill all the foreman jobs.

"It is possible, however, by training to develop certain men into leaders. The chief things we try to instill into our foremen is that they are representing the company and that they must, therefore, be absolutely square and honest in all their dealings with the men. Our management never promises the men anything it does not fulfill, and we make our foremen understand that they must carry out this policy to the utmost."

Monotony Work

In this truck plant the problem of monotony work has not become serious up to the present time. While there are, of course, numerous routine jobs throughout the factory, production has not reached the large quantity stage. Nevertheless, the presence of the problem is recognized. Superintendent Butler has considered this matter rather

carefully and expressed some interesting thoughts along this line. He said in effect:

"While only a few men are natural leaders, I think the majority of men in our shop desire change. That is, they become tired of performing the same operation over and over again. We had two men on a crankshaft machining job, for instance, not very long ago. One of these men had been on that job for two years. Finally he came to me and said he would either have to be changed to another job or leave the plant. He was seeing crankshafts go round in his sleep.

"We try to watch this sort of thing and not let it get that far. We changed that man, of course, but we usually try to change them before they get that way. The normal man does not like to have his mind dulled and be tied down to doing exactly the same thing in the same way day in and day out. And you can't blame him.

"Once in a while you run into an exception. I told the foreman the other day, for example, to change a man from a Fellows gear shaper job, on which the man had been working for several years. The man had made no kick, but I thought he must be nearly "fed up" on that routine job. So we changed him over to a lathe. Two days later he was in here asking to be put back on the gear shaper. But that is an exception. The average man likes a change and does better work if he gets it; his production is better, both as to quantity and quality, in the long run.

"It might be possible to establish cycles of change for men on certain jobs, routing the cycles in such a way as to progressively improve the man's production ability and worth to the company. That would require years of study and a very careful investigation of all the factors involved. We have not come up against the monotony work problem to a serious enough extent at present to make such procedure feasible."

The men here are encouraged to use their intelligence and are given the benefit of results which they obtain. One man, for instance, was running two automatic machines on the task rate bonus system. As the bonus man passed through the shop one day and happened to speak to him, this workman said:

"I wish I had another machine here. I could run a third machine all right. What would you do if I ran three machines?"

The bonus man took the matter up with the superintendent and it was decided to pay this man as though he were one and one-half men and let him run the three machines. The suggestion was made by the man; the company profited by the increased production and the man was given the entire benefit of his increased production. Such actions as this on the part of a management go further toward gaining confidence and co-operation from the workers than any number of speeches and editorials.

Service Feature

Along with these more important fundamentals, this concern has in operation a number of the more usual service aids for its employees. It maintains a dental department, a dispensary, an x-ray department, a company restaurant, an oculist and a legal service. The legal service has proved especially popular with the employees. One afternoon each week it gives advice to any employee wishing it. A practical nurse or matron has charge of the girls' rest rooms. This woman acts as intermediary between the female employees and the production manager, as many situations arise that cannot be taken care of by male foremen.

Resting as they do on the sound basis of the fundamentals previously described, these various employees'

service activities fill a proper and useful place in the working out of the labor policy.

Results Achieved

Excellent results have been achieved by following out the general principles outlined. Production per man has been materially increased over a period of years. Superintendent Butler is authority for the statement that this increase can be attributed largely to the co-operation of the individual workers and to the way in which the company has handled its labor problem.

In normal times the plant employs about 1300 men, and is running at about 60 per cent of capacity at present. Every effort has been made to hold the old men during the time of depression, and men have been switched from one job to another in an effort to limit unemployment. Neither the base rate wages nor the bonus rates have been cut.

A Slow Growth

At the present time this company has the confidence and co-operation of its workmen. Some idea of the reasons for this fact have been outlined. There is behind it all, of course, a spirit of justice and a real desire on the part of the management to be on the level with the men. This is fundamental.

There is in the shop an atmosphere of "this is a pleasant place to work" that is caught by even the casual visitor if he stops to talk here and there with workmen. We have discussed this matter of "plant personality" at great length in previous articles, but it must be mentioned again, since it does play its part in helping along

the general problem. Like human beings, every plant has a personality. When that personality is pleasing, relations between management and men are always better. But it must be recognized that these important intangible factors cannot be developed in any plant overnight. The general conception of this labor policy has been built up over a period of at least ten years at this factory. The present state of confidence and co-operation is the end of a long journey. Management and men have proved each other through many practical tests. Suspicions have been overcome, not by short talks, but by continuous actions over a long period of time.

A spirit of co-operation, a true friendship, a community of purpose and thought—these things are not achieved by an efficiency engineer, nor by a series of "loyalty letters," nor by a new bonus scheme or stock ownership plan, nor by baseball teams and summer picnics, nor by any purely material and easily installed or obtained things. They are achieved by a long period of honest dealing, of close study of individual workers, by a thorough investigation of every job in the plant, and by a constantly progressing development of all the factors affecting human relationships in industry.

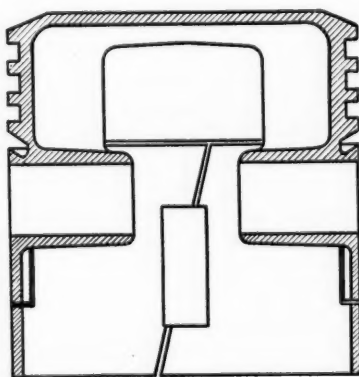
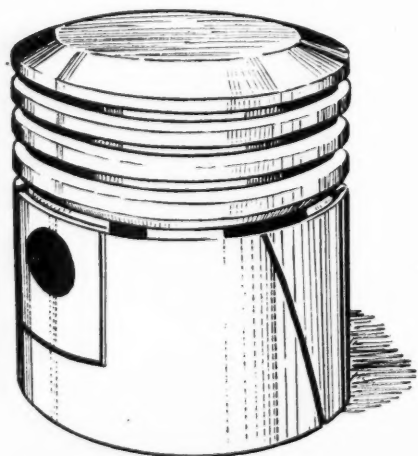
It may be objected that such methods take too long and are too much trouble. But they are permanent and pay for themselves as the development takes place. The labor expert who offers a sure and quick cure is just as much a charlatan as the patent medicine man of old. The permanently progressive things of industrial success come from careful experiment and hard work and study—in industrial relations as well as in mechanical development.

A New Aluminum Piston

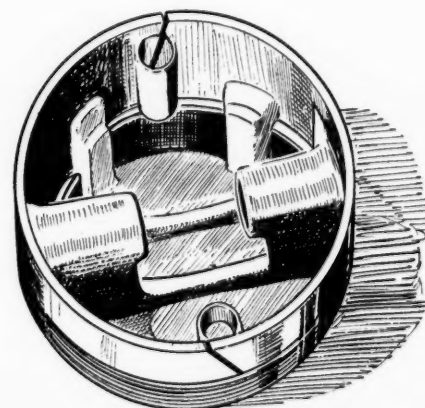
THERE is much evidence that the aluminum piston is in a new period of development, for new designs are being brought forward constantly. The objectionable features of the earlier designs are fully understood, and inventors are endeavoring to overcome them. The illustrations herewith show a piston manufactured by the Waddell Motor Corp. In this piston the skirt is partly detached from the ring belt and the lands between the ring grooves are turned with sufficient clearance so there can be no trouble from seizing. Only the skirt is depended on for bearing surface. Those portions of the skirt around the ends of the piston bosses are relieved and are detached from the rest of the skirt by saw slots. The bosses connect with the piston head and the ring belt by two substantial ribs running parallel with the piston pin axis.

The skirt is split on the pressure sides by inclined saw slots, but round bosses are cast on the inside of the skirt where these slots come and these are later drilled out and form a springy connection across the slot. The only connection between the skirt and the ring belt is furnished by four shallow ribs extending from the head to the skirt.

FINLAND imported in 1920 751 automobiles valued at 31,500,190 Finnish marks, and 264 metric tons of oil and steam tractors valued at 7,211,970 marks. At the present time motor vehicle business with Finland is rendered practically impossible by an embargo decreed on Feb. 12 last from which exceptions are made only in very urgent cases.



Waddell aluminum piston



A Novel Method of Hobbing Worms

A helicoidal cutter is one of the features of this new method. The action of the hob is in the nature of a progressive roughing and finishing operation. The metal is removed progressively and the cutting action is distributed over all the teeth. This article discusses the process in detail.

THE screw or worm and its mating gear constitute an extremely ancient combination. The compactness and simplicity of design, and the large speed reduction attainable, make it peculiarly applicable to many types of mechanism. When rigidly mounted and properly lubricated, this gearing is noiseless and one of the most efficient means yet developed of transmitting power between shafts lying in different planes.

Worm gearing has not been used in the past to as great an extent as its merits would seem to indicate. This has been due, principally, to two reasons: First, difficulty of producing correct multiple-threaded worms and worms with an excessive helix angle, and, second, inability to successfully produce correct worm gearing of small velocity ratio, approaching one to one.

Most worms are made with helicoidal teeth, and this article will deal with worms having teeth of that contour. The axial plane of a helicoidal worm is a plain, involute rack section, and the teeth of the mating gear, at the central plane, will have involute curves thereon, unrolled from the basic rack.

A single-threaded worm with a moderate helix angle can be successfully threaded in the lathe. The lathe tool used can be set parallel to the axis of the worm, or can be set normal to the tooth helix. In the first case, it would be necessary to reverse the worm after finishing one side of the thread, and then cut the opposite side, due to the impractical cutting angles otherwise obtained on a double-sided cutting tool. When a straight-sided tool is set normal to the tooth helix of the worm, a modified form is produced in an axial plane, and the hob used to cut the mating wheel must be changed to correspond.

With the evolution of the machine tool industry, and the development of machines which in production far outstripped their predecessors, the process of milling worms with a disc cutter was originated. This method answers very well for single-threaded worms, and is much faster than cutting the threads in a lathe.

To obtain a worm with true helicoidal teeth, with straight sides on the linear or axial section, it is necessary to correct the shape of the disc cutter, owing to the interference of the cutter and the helicoidal surface on the worm tooth. This is done by forming a lead or cast iron disc to the proper contour, and using it as a template in making the cutter.

If the above process is not employed, the advantage of having a basic rack section and conjugate teeth on the mating wheel unrolled therefrom is lost. Such a formed cutter, of course, can only be used to thread worms for which its tooth contours were intended. Worms of dif-

ferent diameters, threads or linear pitches require cutters made specially therefor.

The Gould & Eberhardt Co. have developed a novel method of hobbing worms, which is claimed to be as far in advance of worm milling with a disc cutter as the latter was superior to the old process of cutting the threads of worms in the lathe.

The production of multiple-threaded worms by the lathe or thread-milling process, necessitates intermittent indexing motions, either hand or automatic, with their inevitable resulting inaccuracies. The hobbing method, with progressive and continuous indexing, entirely eliminates this objectionable feature.

In the hobbing of worms, either single- or multiple-threaded, a hobbing machine is used with the gearing ratios throughout so chosen that a velocity ratio of one to one is readily obtainable between the cutter and work spindles and the machine operated just as when cutting helical gears.

One of the novel features of this new method of hobbing worms is the helicoidal cutter employed, which also permits worms to be hobbled which have a shoulder on either or both ends.

The hob, illustrated in Fig. 1, possesses several distinctive features. The teeth are arranged in a helical formation similar to gear hobs. There are about fourteen roughing and three finishing teeth. It will be noticed that there are only about one and one-half convolutions of teeth, thus making this hob much shorter than gear hobs, the length being about twice the normal circular pitch of the worm.

The action of the hob is in the nature of a progressive roughing and finishing operation. The roughing teeth have their tops and sides reduced in regular decrements, starting with the last finishing tooth and ending with the first roughing tooth. This portion of the hob has somewhat the appearance of a spiral. The lowest tooth is made high enough to cut into the periphery of the worm as far as its center line, while each succeeding tooth takes out a little more metal, ending with the finishing teeth, which smooth and complete the worm tooth shape. The arrangement of teeth just described, and the cutting action secured thereby, make this hob analogous to a broach coiled around a cylinder. The removal of metal is accomplished progressively, and distributes the cutting action over all teeth.

If the hob is made in the ordinary manner, it will be found that the following side of the hob teeth will, if uncorrected, cut away a part of the worm tooth from the pitch line to the outside diameter of the worm.

This necessitates a different lead on the two sides of

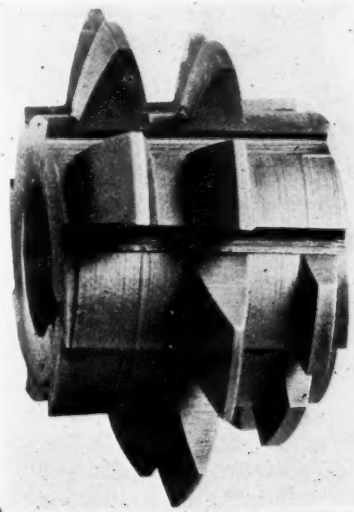


Fig. 1—Worm hob

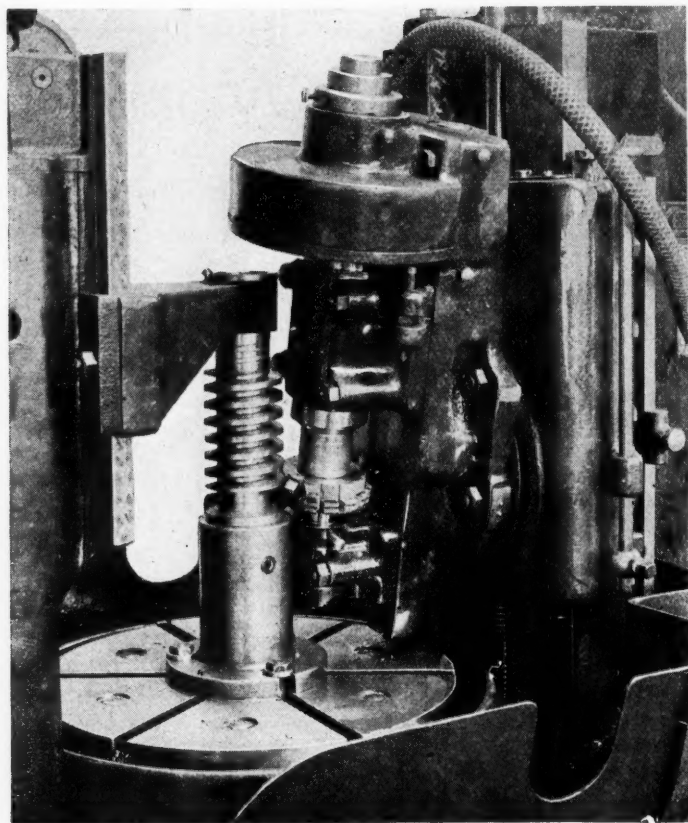


Fig. 2—Machine cutting single-thread worm

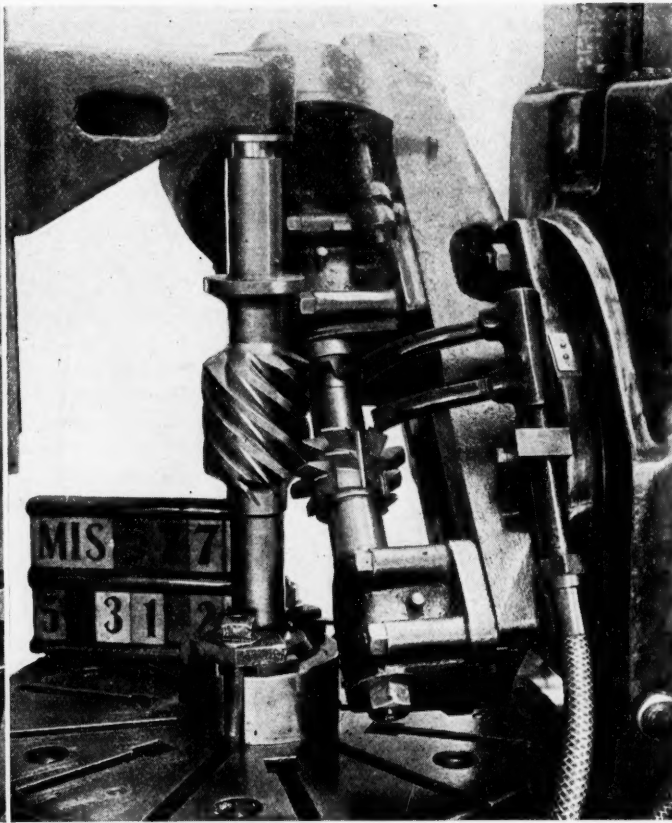


Fig. 3—Machine cutting seven-thread worm

the teeth, the leading side being made to the basic lead calculated from the normal circular pitch. The following side is recut to a shorter lead, sufficient to clear the theoretical contour of the worm tooth.

When the machine is set up, the middle finishing tooth is centered with the axis of the worm. The roughing teeth lead, and the finishing teeth follow, in the direction of hob rotation.

The production and accuracy attainable with any worm-threading process are to the practical man the outstanding features by which the merits of a given method are mainly judged.

The production possible with the hobbing method is said to be much greater than that which is possible with the late or disc cutter method. This is especially true of multiple-thread worms, as the machine is geared for the number of teeth, just as in hobbing helical gears. This obviates the necessity of indexing by hand and taking a fresh cut through the worm for each tooth, which must be done with a lathe tool or disc cutter.

The accuracy of worms produced by the hobbing method as outlined is said to be superior to any of the other known methods for the reason that in this system the cutting action is progressive and continuous and produces accurately spaced multiple-threaded worms, which is an essential feature in efficient and successful worm drives. The cutting action is a result of the generating characteristics of the machine, and not dependent upon other devices which may be inaccurate or inaccurately operated.

The amount of feed to the cutter and worm blank relatively to each other in an axial direction is dependent upon the helix angle of the worm. That is to say, the greater the helix angle of the worm with the axis, the less the axial feed.

The hobbing method is also adaptable to roughing worms which are subsequently heat-treated and then ground. In roughing with this system the amount of

metal remaining to be removed by grinding is uniform and the spacing of teeth on worm is accurate, permitting a high degree of accuracy in the final grinding.

The fixture for holding the worm blank should be of a very rigid design, with powerful means for driving, because the strains on this mechanism are severe.

Fig. 2 shows one of these hobs mounted in a gear-generating machine finish-threading low-carbon steel worms, single-threaded, of 2.7-in. pitch diameter, 0.666-in. linear pitch, with an output of one every 17 minutes, floor to floor.

Fig. 3 shows the rough-threading operation on an alloy steel, seven-threaded worm, 4.3 in. outside diameter, 4½-in. face, 1.37-in. linear pitch. The time to thread this worm is 60 minutes, floor to floor. The teeth are, of course, ground to final size later.

Another example of production is the threading of alloy steel quadruple-thread worms, 2.8-in. outside diameter, 4½-in. face, 1.06-in. linear pitch in eight minutes each, floor to floor.

Another field in which worm hobbing has proven very successful is in the threading of multiple-threaded automobile steering worms. The worms were produced with very accurate spacing and a good finish. A double-threaded steering worm for one of the well-known cars, of 2.09-in. outside diameter, 1½-in. face, 0.52-in. linear pitch, has been finished in 15 minutes each, floor to floor.

AN abstract report of investigation conducted by the Bureau of Standards on scaling of enamels has been submitted to the Journal of the American Ceramic Society. A co-operative committee of the Enamel Division of the society met at Cleveland on June 20 to consider recommendations of the Bureau for co-operative work, both in the steel and iron mills and in the enameling plants. It is believed that results of the Bureau's work can be put into actual commercial practice through the efforts of this committee.

Relative Value of Aluminum and Steel as Body Panel Material

The writer believes the field for composite aluminum bodies to be where production is limited to 10,000 or less. This construction is also valuable in the development of new body designs. The pressed steel body is specially adapted to quantity production.

By E. J. Bartlett*

THE purpose of this paper is not to discredit the use of materials other than aluminum for the metaling of automobile bodies of the passenger type. It is, rather, to define, in a non-technical way, the limitations of the fields for use of the two principal materials used for the sheathing of bodies—annealed sheet steel and sheet aluminum. Any other materials, such as laminated wood panels, cast aluminum sections and the fibrous compositions, are so little used that we may omit them from further discussion for passenger car service, except as occasionally used auxiliaries.

There are three distinct types of automobile bodies, from a constructional standpoint, in every-day use. These are the aluminum composite body, the steel composite body and the all-steel body, using the terms common to the industry.

Aside from the standpoint of quality, which will be discussed later, which of the three types of construction to use is economically determined by just one factor—the quantity produced.

To illustrate, a single body can, naturally, be produced more cheaply by using a wood framework and sheathing it with a ductile metal, such as aluminum, than by the use of a less ductile and more difficult metal to smooth and finish, such as sheet steel. Of course, an all-steel body would be prohibitive.

This same situation is undoubtedly true for ten bodies or 100 bodies or 1000 bodies or possibly 5000 bodies. The border line where the economic use of the composite aluminum body gives way to the composite steel body can be accurately determined for only each individual case where the die cost for the particular design of body can be determined, together with a comparison of labor costs for the two constructions. Somewhere there is a volume point where the composite steel body is the cheaper, and in spite of its disadvantages, none of them vital, economy will compel its use.

For average conditions this point may be conservatively taken at a minimum of 5000 when little regard is given to smoothness and quality, and a maximum of 10,000 when economies of production will probably offset all advantages of the composite aluminum construction. Often in this intermediate field a part aluminum and part steel body is the best solution, as one type of construction gradually merges into the other.

For larger quantities the composite steel body has the field. Here the quantities are sufficiently large to permit a considerable expenditure for dies of proper completeness to produce finished steel stampings. A point

often overlooked is the quality which can be built into steel stampings with proper dies. A cheap die job only passes the buck, as to expense, on to the finishing operations, which to some extent accounts for the seemingly high point where aluminum really gives way to steel in economical production.

The field of the composite steel body is then a minimum of some 5000 to 10,000 bodies with a maximum of perhaps 30,000—the exact quantity governing the change depending upon the design of the body, facilities for building, etc., exactly as in determining the lower point.

The All-Steel Body

Beyond the quantity of 30,000 or thereabouts comes the field of the all-steel body. Large dies and assembling fixture expenses may then be assumed. An equipment for such work would possibly not exceed \$5 or \$10 per body, and, while this amount might have to be spent in finishing, a speed of production would be attained entirely impossible with composite aluminum construction.

We may then summarize the three distinct methods of body construction about as follows:

Up to 10,000, composite aluminum bodies; 10,000 to 30,000, composite steel bodies; over 30,000, all-steel bodies.

Few bodies are ever built in the quantities first planned without change, and therein lies one of the prevalent false economies of the steel body of either type.

New body types require a period of perfecting and seasoning before they are ready for quantity production. The tendency is to shorten this necessary development through the investment in a die equipment, with the result of an early abandonment of the type or continual dissatisfaction with it.

Aluminum is the ideal metal to use during this seasoning period, as it is cheaper, better in numerous ways and more truly represents, even in small quantities of bodies, the excellence which may be expected in the larger quantities when the dies and stampings are perfected.

The value of this flexibility during the period of stabilizing a body design is often difficult to reduce to a dollar-and-cent basis, although it has a very marked worth. It is to quite an extent the little niceties of a body, not necessarily expensive, which stamp the finished car with an individual sales appeal and, in a close competitive market, assist in making retail sales.

In the foregoing, arguments have been advanced to show why the hand-formed steel panel body has no true field. as from a cost viewpoint it has nothing to recommend it.

*Vice-President, The Baker R. & L. Co.

When quality is considered, this method of body metalizing is at a further disadvantage. Therefore, from both cost and quality considerations composite bodies should be sheathed in aluminum panels until properly pressed steel panels are practical.

Aluminum has the advantage over steel in that, when hand-formed, smoother surfaces and truer contours result. It is easily file roughened and presents a better paint surface, therefore a more lasting paint finish can be applied. It is lighter than steel, although requiring a slightly more extensive wood framework. It is less resonant than steel, hence in an inclosed body lessens drumming. It is more readily repaired than steel, is more

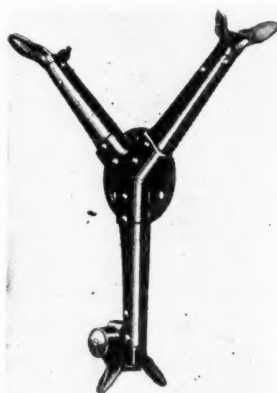
easily welded and is more uniform in welds as to strength and finish. Aluminum is rustproof and requires no rust-proofing treatments, or if paint is scratched through, a wound does not occur which gradually spreads, due to rust. Bodies in storage do not rust when sheathed in aluminum.

Some of these advantages of aluminum panels are offset by the single advantage of steel panels—their additional strength. Where the volume of bodies of a fixed type make steel die pressed panels practical from a cost standpoint, the relatively minor advantages of hand-formed aluminum panels are not essential to a satisfactory body product.

Some New Automotive Parts

A Pressed Steel Tire Carrier

A TIRE carrier recently introduced on the market is so arranged as to be interchangeable with the dummy hubs used to carry spare wire or disk wheels. This permits the car manufacturer to mount a standard carrier support bracket on each car as it moves forward in production. If the car uses wood wheels as regular equipment, the carrier is bolted to the face of the bracket, whereas if disk or wire wheels are to be used, the car maker bolts an ordinary dummy hub to the bracket.



The Oakes tire carrier with lock to prevent tire theft

The carrier is made of pressed steel parts riveted together. It requires no straps or fittings to hold the tire rim firmly in position, a simple rim clamp of conventional type being used on the lower arm of the carrier, and the tire is readily mounted or demounted by unscrewing or tightening one nut. The carrier is made in a wide variety of wheel sizes to fit all demountable rims and in single and double carrier styles.

As optional equipment a locking device, shown in the illustration, is installed in the lower arm of the carrier. It comprises a rim wedge-clamp integral with a barrel-shaped casting which has a circular lock flush with the outer face. This device serves to prevent unscrewing the nut and demounting the tires. The lock is firmly held in the housing by its two lugs which expand behind the circular flange, yet it is easily removed from the housing by using the proper key, after which a socket wrench is used on the clamp nut which holds the tire. The carrier is manufactured by the Oakes Co.

Transmissions for Speed Wagons

ONE of the chassis components that has had to be redesigned to meet the new requirements arising from the use of pneumatic tires on trucks is the transmission. In order to take advantage of the possibilities of the pneumatic equipment in the way of higher speed, the final drive reduction ratio must be kept small. But this calls for a high low gear reduction ratio in the transmission, as the low gear ability of the truck must be maintained the same.

Two transmissions of the unit power plant type, for speed trucks, have been developed by the Warner Gear Co. and are now in production. They are suitable for

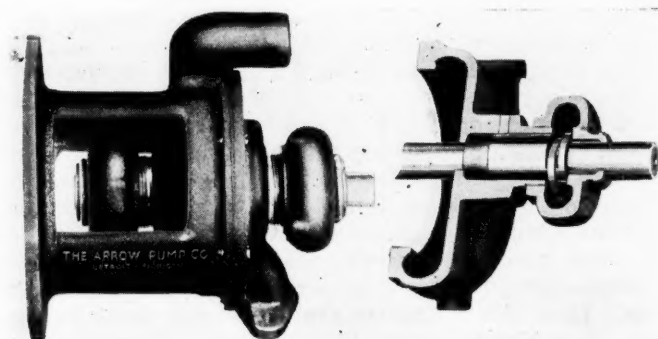
trucks of $\frac{3}{4}$ to 2 tons capacity.

One model carries a reduction of nearly 4 to 1. In the other design, the reduction is nearly 5 to 1, a new development in three-speed transmission design.

Double row bearings at the main shaft rear take propeller shaft thrusts. Different length control and brake levers are available. The clutch is of serrated tooth, multiple disc design. The housing is cast iron. An opening is provided for a tire pump or a power take-off attachment.

New Design of Circulating Pump

THE weakest part of the ordinary circulating pump is undoubtedly the shaft packing, which often becomes leaky and requires repacking. This is largely due to inefficient lubrication. A new design of pump intended to overcome these troubles has been brought out by the Arrow Pump Co. This pump employs oil lubrication by the so-called ring oiler method and has the packing at the inner end of the bearing instead of at the outer end. The sectional view herewith shows the arrangement. At the present time the bearings of circulating pumps are lubricated with grease by means of compression grease cups. The bearing of these pumps is next to the water chamber and the packing at the outer end of the bearing. This is open to the objection that the hot water is likely to get into the bearing and cause it to rust. Moreover, any foreign matter in the water, such as scale from the water jacket, sand, etc., may find its way into the bearing and start cutting. The new construction, in which the packing is on the inside of the bearing, is said to make it impossible for water and sand to get into the bearing, thus prolonging the life of the bearing and obviating the need of frequent repacking. A metallic, non-abrasive type of packing is used. The packing gland also forms an oil reservoir, thus permitting of the use of the ring method of lubrication.



The Arrow circulating pump

The Trailer's Place in Transportation Merchandising

Part II

This second article discusses the problems of dealer representation in the trailer field, together with the difficulties of truck makers adding a line of trailers. Mr. Perry believes the factory branch system best for trailer marketing, but shows it to be a heavy burden.

By H. W. Perry*

IT has been suggested that a large truck company might undertake the production of a line of trailers and their distribution through its own branches and dealers. There have been intimations that this has been contemplated. Such a policy has its logical aspects. The truck factory, of course, has all the facilities for economical manufacture of trailers and has stocks of parts and materials suitable for the purpose. The work is very similar to truck manufacture and, with the factory operating far below capacity, it would be easy to begin making trailers. The company would have an immediate outlet through its branches or distributors and its established dealers, as it might force them to contract for a certain ratio of trailers to trucks. So the idea has its allurements.

But, while such a method might be successful, there are some important factors that militate against it. In spite of the similarity of manufacture there is an essential difference between the truck and trailer. The truck is a standardized product, designed as a compromise to meet general rather than specific hauling requirements and the factory is operated on the system of quantity production of a few standardized models. Trailers, on the contrary, have been evolved to fill the gaps left by motor trucks and to meet a wide variety of special uses. There has been no standardization of trailers and even the largest trailer companies feel under compulsion to produce as many as twenty or more different types and sizes.

According to the particular work to be done, there must be four-wheel trailers, semi-trailers, pole, pipe or logging trailers and two-wheel balanced trailers. Each type must be made in several sizes and some of the types in several forms; for example, the four-wheel type is furnished in straight frames for ordinary trucking and in drop frames for side-dump bodies. Both the four-wheel and the two-wheel types may have to be supplied with hinged frames to permit of rearward tipping for discharge of loads of lumber. Some semi-trailers require platforms that are very low at the rear end to facilitate loading and unloading of cotton bales, heavy cases or hogsheds.

Thus it will be seen that there is as much variety in the manufacture of trailers as in that of truck bodies, and the demand for any one model is so limited as to make it almost impossible to get into quantity production on a systematic basis. The same reasons that caused

truck companies to forego the building of bodies will keep them out of the trailer field. Special jobs disarrange the factory system, cause annoyance and are seldom profitable. A truck company embarking in trailer manufacture might decide to produce only a few standardized models, but would soon find that these would not meet nearly all the requirements of purchasers of its trucks and would have to add more models or let the customer go elsewhere. All considered, the truck manufacturer would do better to capitalize the development of trailer transportation by adding road tractors to his line of standard trucks.

Selling Differences

There is even more difference between the selling of trucks and trailers than in the manufacture of the two lines. Neither factory nor dealers would know in advance what relative numbers of trailers of different types and sizes could be marketed with a given number of trucks. The sales records of leading trailer companies show curious fluctuations in demand for different types and sizes from month to month and year to year. The market is still unsettled. Trailer makers themselves have not yet been able to determine to their satisfaction what types and sizes will be in greatest demand and most profitable. And even with a wide-open field the manufacturers individually are not producing and selling in large numbers. A truck company entering the business would not have as broad a market as a trailer company, because its sales would be confined largely if not entirely to users of its own make of trucks. Other truck companies and dealers would not send a trailer customer to a competing truck company or dealer but would naturally recommend to their customers the trailers made by an exclusive trailer company.

A glance over the brief history of the trailer industry indicates that the manufacture of trucks and trailers by the same company has not been successful. A number of companies that began the manufacture of both have dropped one line or the other and it is believed that today there is not a single company actively manufacturing both lines.

Some disposition has been shown for a truck company to tie up with a single trailer company to handle trailer sales through its dealer organization. This is open to the same sales objections as already mentioned and to the further obstacle that unless the trailer company makes a very complete line of all types and models, the organization will not be in position to meet all demands

*Recently general manager of the Trailer Manufacturers' Association.

of its customers. An arrangement of this kind would be more advantageous, however, to the truck company than to the trailer maker, since buyers of the truck could go into the open market for trailers, but the trailer maker would be limited in sales principally to users of the one make of truck. The owner of any other make, if he became interested in trailers, would be most likely to consult the man who sold him his truck, and if that dealer did not handle trailers himself, he would either discourage the idea and try to sell him another truck or at best would refer him to some trailer man who did not sell trucks.

Confronted by the various difficulties of marketing their product through the truck trade, the trailer manufacturers have had to seek other outlets. The only way they had of interesting prospective purchasers and informing them of the merits of trailer transportation was to get in direct touch with the users of motor trucks. This has been done with considerable success and enough demand has been created in some localities to make dealers eager to take on a line of trailers. It has been necessary, in the larger communities at least, to have a representative sell trailers exclusively or in connection with other lines than trucks. Thus, some of the best trailer representatives are distributors of truck bodies, hoists, loaders, etc., while others handle farm tractors and agricultural machinery, building materials, iron work or other lines. But in each case it is a matter of finding the right man, regardless of his business—a man who can grasp the essential advantages of trailer trucking and has the necessary faith in its future, the ability to convince others, determination to stick to it and wait for profits, and no conflicting interests. Such a man is a valuable find and usually the trailer manufacturer goes as far as possible to help him, sometimes making him a branch manager.

Exclusive Trailer Representative

Experience to date indicates that, until the manufacturers have succeeded in educating truck owners generally to the many advantages and economies of trailers, they will find it absolutely necessary to have exclusive representation and to sell direct to users rather than through truck dealers, although they would greatly prefer the latter method. This makes the marketing slow, difficult and expensive and restricts sales promotion chiefly to the larger centers of population. Sales possibilities in the small communities are yet too limited to afford living profits to exclusive representatives, and

without a widespread distribution system, national advertising is ineffective because scattering inquiries cannot be followed up advantageously. This condition will be overcome gradually as trailers become better understood and more extensively used and the attitude of the truck dealer changes. The truck dealer may quickly come to the conclusion, with encouragement of the truck manufacturer, that under present conditions it will be worth his while to sell a line of truck auxiliaries, including not only trailers, but standardized bodies, hoists for dump bodies and other equipment. In short, it will be his function to sell motor haulage equipment, to become an expert in highway transportation and to recommend and sell whatever equipment best meets the requirements of each particular customer.

Lack of understanding and interest on the part of truck dealers has forced the largest trailer companies to establish their own branches in the principal cities and the smaller companies to create very close affiliations with specialty men that result in relations closely approaching those between the factory and the branch. Distribution through factory branches is most satisfactory provided good managers are found because this system avoids all the disadvantages of trying to create sales through motor truck agencies and because intelligent and interested advice and service can be and is given to prospective buyers and actual users.

The matter of service is not very serious where there is a proper amount of interest in the success of trailer installations. In the first place, there is not much in the mechanism of a trailer to go wrong, and in the second place the trailers made by established manufacturers are constructed of parts that are practically standard in the automotive industry, except for relatively few special parts, such as drawbars, couplings and certain steering gear castings or forgings. Bearings, tires, springs and other parts most subject to wear are identical with truck parts. The factory branch can give fairly good service even at considerable distances and smaller towns need not suffer seriously from lack of service. Truck dealers could give excellent parts service in their territory, but good service consists in more than supplying new parts; it calls for supervision of trailers at work, with advice to the user how to get the best results and tactful dealing with drivers who may, for one reason or another, find fault with the trailer.

The establishment of branches involves a great deal of initial expense and they are seldom self-sustaining for the first year or two. The financial burden is greater



Underground storage tank weighing 7 tons hauled with $3\frac{1}{2}$ ton Army truck and two-wheel pole trailer



Train of steel side dump trailers with loads of ashes at city dump in Indianapolis. The city uses 25 of these trailers for ash removal

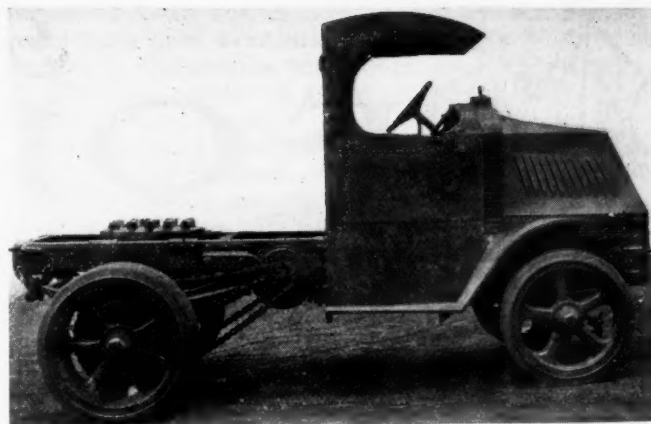
than most of the trailer companies are in position to stand, but the tendency is in this direction and it is believed that the branch system will ultimately be the most successful and economical method of distribution. There will still remain, however, the problem of desirable representation in the smaller places. A relatively larger potential market exists for trailers than for trucks in the remoter places, as among farmers, ranchmen and plantation owners and in lumbering and mining regions. Many possible small sales or doubtful fleet sales possibilities in such fields are neglected owing to lack of nearby representation and the time and cost involved in investigating them.

Local representation is therefore highly desirable even if it only serves the purpose of seeking out possible buyers and making first investigations to determine the desirability of having the branch or the distributor send a man to follow up the lead.

Future Selling Policies

Only time and changing conditions will bring a solution of the problem of merchandising trailers. Perhaps no hard and fast policy will prevail. Probably the best general plan will embrace a combination of trailer branch houses in the principal cities, exclusive representation wherever possible in second-class cities and truck-trailer dealers in smaller communities, provided the truck dealers follow the lead of the truck makers in taking the trailer seriously. As the truck manufacturers continue their investigations and become convinced of the practicability and economy of trailer transportation in various industries and under certain operating conditions, they will pass their findings on to their distributors and dealers and these in turn will co-operate better with trailer representatives in the field. No doubt in time mutually satisfactory arrangements regarding division of commissions will be made between truck and trailer dealers.

At present the truck dealer or salesman who tips off a trailer man on a prospect expects some recompense, but has not yet reached the point where he feels he should give up any part of his own commission on the sale of a truck to the trailer man who digs up a purchaser. There must, of course, be fair reciprocity. Truck and trailer sales will go hand in hand more and more as time goes on. The truck gained great headway over the trailer during the first decade and a half of the twentieth century and there are to-day about 1,000,000 commercial motor vehicles in service in America as compared with an estimated total of 50,000 trailers, based on registrations of 20,000 trailers in fourteen States last year. The bulk of trailer sales will therefore be made separately to present truck owners for some time, but as municipalities trailerize their garbage and ash removal and special indus-



15 ton tractor used by Southern California Edison Co.

tries equip with tractors and semi-trailers or pole or pipe trailers, the power unit and carrying units will be purchased at the same time. Buyers will prefer, no doubt, to deal with a single seller and to make the purchases in one transaction. This will tend to bring the truck and trailer interests closer together.

Furnishing Transportation

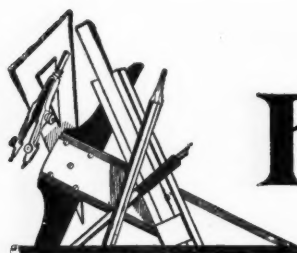
While the interest of the truck and trailer sales managers in this subject is or should be based on the desire to furnish the best means of highway transportation, the fact remains that the former is concerned primarily with the increase in truck sales through the trailer as an auxiliary. He cannot take the same interest in the trailer as in the truck so long as the two lines are manufactured and sold by different organizations. It is through the tractor end that the truck industry will be compelled by force of circumstances to give a great deal of attention to trailers and to advocate their use, as the writer is convinced that eventually most heavy haulage will be done with tractors and semi-trailers—that is, six-wheel outfits. The four-wheel trailer may be expected to find its greatest field of utility in long-distance work, such as intercity hauling, and in operations where road trains of several units will best meet the requirements.

It is most desirable that in all cases the power unit and the trailing unit be suited to each other so as to form a properly functioning combination, but it is not necessary that the two should be made or marketed by the same organizations, any more than in the case of locomotives and railroad cars, or of horses and wagons. But the truck and trailer industries will have to work in harmony and help each other in the common undertaking to make motor transport 100 per cent efficient and satisfactory.

A Pyrometer Made from a Camera

A SIMPLE pyrometer can be constructed from a photographic camera, according to an article by Dr. Lux in the *Elektro-technische Zeitschrift*. To this end a small box is screwed onto the camera, which takes the place of the plate of ground glass and contains in the plane of the sensitive plate a small incandescent bulb provided with screens. Into the rear wall of this small box is inserted a lens, the ocular of an old telescope or opera glass serving the purpose well. The complete outfit includes also a pocket flashlight battery, a movable coil milli-ammeter and a simple sliding rheostat. In use, the operator focuses the object whose temperature is to be determined, which can be readily done by means of the pho-

tographic adjuster, and then regulates the current sent through the bulb by the flashlight battery in such a manner that the filament of the bulb disappears in the field of the sliding object. The current strength read off at that instant, in conjunction with an easily determined calibration table, permits of reading off the temperature sought to within 2 per cent, as the eye is very sensitive to any differences in the luminosity of the filament and the incandescent body. This pyrometer is suitable for temperatures between 600 and 2100 deg. Cent. if an ordinary osram bulb is used, but can be used also for temperatures up to 3600 deg. if the objective is shaded off and even up to 6000 deg. if a slightly blackened glass plate is inserted.



The FORUM



Seating and Other Car Improvements

Editor, AUTOMOTIVE INDUSTRIES:

(1) "The Forum" in your issue of June 16 is very interesting and it would certainly be of great advantage to your readers, as well as of value to your paper, if more of the engineers engaged in the manufacture and design of cars would continue to contribute their views and in the end perhaps succeed in eliminating some of the existing defects of all automobiles.

(2) Of course, each engineer's own design may be perfect from his point of view, but if, as pointed out in one of the letters, before driving and maintaining their own machine they tried out the other fellow's, they should recognize his defects and might, in the end, see that they themselves were not so far behind.

(3) **Inaccessibility.** The first great defect to which all cars are subject is inaccessibility, and this applies to all cars, whether selling for \$1,000 or \$10,000. Apparently the only aim of the engineer is to get the car together and get rid of it, for he knows mighty well the poor purchaser can never get at it if anything goes wrong, and, no matter how trivial this may be, he will have to run it into a service station if he can get it there.

(4) If, on the other hand, as suggested by Mr. Anglada, every designer were compelled to run and maintain his own car for a given time he would eventually see some of the shortcomings, especially if they would put him on an isolated island and give him only the beautiful set of tools usually sent out with each machine.

(5) **Mechanical Defects.** The mechanical defects, of course, will always exist and these are in a class by themselves.

Great improvements have already been made and a full discussion of these in the Forum should be of great advantage and lead to still further improvements, but in addition to these there are many fallacious ideas of details and standards that have been introduced into automobile construction that it is necessary to get away from.

(6) **Body Design.** The matter of seating capacity mentioned in Mr. D. Ferguson's letter, is one of the fallacies or myths of the automobile industry and he is quite right in regard to designing the body for two, four or six passengers and to carry only two passengers on the rear seat, for the automobile has never yet been made that will carry three full-grown persons comfortably on the rear seat. The rear seat will not even carry two and one-half persons as Mr. Ferguson says; three persons of three-quarter normal size is the limit. The minimum space required for comfortable riding for a full-grown person with overcoat and wraps is 20 in. or 60 in. for three persons. Three three-quarter persons require $3 \times 20 \text{ in.} \times .75 = 45 \text{ in.}$ or 2.25 persons, and this is the maximum width of rear seat inside it is possible to get. Now three $\frac{3}{4}$ persons can ride comfortably on the rear seat as they are nicely wedged in and don't slide about, and in cold weather when bodily contact is not objectionable, are the only ones that can ride comfortably on the rear seat. It is most uncomfortable

for one or two persons as they slide all about and no way is provided to hold themselves against the sway of the car in rounding curves, turning corners and in passing other vehicles and the result is that the rear seat, which the owner uses and pays for is the least desirable seat in the car.

(7) The fact is, that the rear seat can never become a comfortable seat for one, two or three persons until the seats are individual and the back conforms to the body to hold it for side sway and it is also fitted with a fixed or folding arm to separate the two parties and so give them the ease of riding of an easy chair.

The easiest riding seat in the whole car is the divided or separated front or driver's seat, provided the width of the body is sufficient to allow a suitable width of seat after allowing for a 7 or 8-in. passage between the front seats. The incline of the foot board helps to make this seat easier riding than the rear seat, as the feet rest in a natural position and one can brace oneself. When foot rests are provided for the rear seats they should be of soft material and similarly inclined and adjustable or made wide to accommodate the different size passengers.

(8) Usually these separate front seats are made in part uncomfortable by having no supporting arm and back on the inner side, especially in many sedans, and so giving no lateral support to the body. You are compelled to grab the side of the car or slide off into the space between the two seats. Every sedan the writer has ever seen or ridden in has this defect, although most cars with touring bodies and separate seats are much better.

(9) This is probably due to the fact that the front sedan seats are made more or less separate from the body and the width of body itself is not sufficient. Taking the overall width of the front seats at 20 in. you have 20 in. plus 20 in. plus 8 in. or 48 in., which is impossible for the inside width of body and you have either to narrow the seats or passage or both.

(10) **Folding Seats.** The folding seats on nearly all cars could be greatly improved and the only ones at all practical are those having arms that fold also. The narrow flat disappearing seats may be pretty to look at when folded, but are of no use for continuous or long rides. When a purchaser pays \$4000 to \$10,000 for a car he expects to have every person ride in comfort, and further, he only buys a six or seven-seater because he expects to utilize the extra seats, and it is rather surprising to see what some of the makers have the temerity to offer.

(11) **Seating Arrangement.** The seating arrangement of all closed cars, limousines, sedans, etc., would be greatly improved if all seats were separate and could be revolved and fixed in any desired position, as they would be much easier for long rides and the individual could adjust the seat to his own convenience, and this would be very restful and would be much more sociable. This would also apply in great measure to the touring car, as it is not essential that any one except the driver should have a fixed seat facing front and even this could

well be adjustable and quite distinct from the body. It would certainly simplify and cheapen the body construction to have the seats independent of the body and the seats would then interchange for all types of bodies whether touring, sedan, close coupled, coupe, coupellette, etc. If these seats were mounted on tubular pedestal the entire inside of the car would have a clear open space to carry loose packages and parcels and be much easier to clean. Further, all of these seats might be adjustable for height to suit the different individuals.

(12) **Depth and Incline of Seats.** The depth and incline of seats required for comfort for the individual vary with the height of the seat; whereas, if these are adjustable both a fixed incline and any depth of seat can be used, but now oftentimes these seats are very uncomfortable.

(13) **Cushions and Upholstery.** The present cushions and upholstery are very heavy, clumsy, dirty and uncomfortable and would be much improved by using pneumatic cushions and backs, which might be separately attached to the body and easily removable. They would be much easier and softer riding, cheaper to make, lighter and more sanitary. Where you now have a 6 to 12-in. depth of cushion and back you would require only 4 to 6 in., or even less on the back, which would make a considerable saving in space required. As regards comfort in riding, there would be no comparison as you would eliminate entirely the vibrations of the car, especially if a pneumatic foot rest cushion were used.

(14) **Carrying Extra Tires and Detachable Wheels.** The most unsightly and disfiguring thing about the automobile is the carrying of the spare tires and the detachable wheels, exposed and in the dust and dirt. All close coupled cars and single seaters now have a rear projecting housing sufficient in size to carry one or two tires or wheels within the housing and free from dust and dirt and this would greatly improve the appearance of the car. All types of bodies could very easily be provided with a similar arrangement and in addition to carrying the two wheels or tires would have space around them available for carrying tools, dress suit cases, etc., and give a space that would be accessible at all times without having to disturb any of the passengers. The present arrangement of carrying pump, jack, tools, etc., outside or under the seats and disturbing the passengers in case of puncture of tire or any other mishap is quite objectionable.

(15) **Width of Body.** Whatever the width of the body may be or the width of the tread, the body should be free of the mud guards and these should always be attached to the chassis and form a part of the complete chassis, the same as the front mud guards. Any type of body can then be mounted on the chassis free from all attachments and any type of standard body interchange on a standard chassis. This would simplify and cheapen both the body and the chassis construction.

(16) The body construction is more or less delicate and can never be designed to carry the weight and vibrations of the mud guards in a satisfactory manner, and moreover, in the event of a slight collision, is apt to seriously damage the expensive body and add much more to repair cost.

(17) **Standard Width of Tread.** Where does Mr. Ferguson get his standard width of tread of 56½ in.? The S. A. E. standard is 56 in., which presumably comes from the old carriage tread. This country has 56-in. tread here in the north, although in the south 60 in. is standard and formerly much complaint was made because automobile makers were forced to make a 60-in. tread for the southern market. Undoubtedly many of the diffi-

culties of body design pointed out by Mr. Ferguson would have been overcome by adopting a 60-in. tread, especially where wide bodies are used and which as Mr. Ferguson points out, is done on practically all cars, whether large or small.

(18) The most fallacious of all standards is the adoption of a standard tread. We spend hundreds of millions a year in making smooth, hard roads and after years of experiment have only now succeeded in making a concrete or cement road that will not rut, and yet the engineers' mind conceives the existence of ruts, and as Mr. Ferguson points out, must design the car to run in these preconceived ruts, and which can only become realities by adopting the absolutely fallacious standard tread whose only function is to create the undesirable rut which the road maker must remove by repair or building an entirely new road.

(19) Instead of a standard width of tread what is wanted is a law that no two cars may be constructed having the same tread but rather as many widths of tread as possible.

What would be more logical would be to have the width of tread vary with the wheel base and the greater the wheel base (and presumably the larger the car) the greater the width of tread.

(20) If the widths of tread varied from, say 48 to 72 in., we would in great measure, if not entirely, eliminate any tendency of even soft or dirt roads to rut, and the different treads would tend to smooth out the roads.

If car treads, say, varied from 48 to 63 in. and trucks from 63 to 72 in., this would be accomplished. Practically now the larger trucks do have this variation of tread and do not produce ruts and except only that all cars have a standard 56-in. tread there would be no tendency to form ruts, and this is the very reason why the width of tread should vary with the length of wheel base and might well be a percentage of the wheel base.

(21) Assuming the width of tread as not less than 48 to 50 per cent of the wheelbase this would work out as follows: Wheelbase 100 in., 110 in., 120 in., 130 in., 140 in., 150 in. Width of tread 48 in. to 50 in., 52.8 in. to 55 in., 57.6 in. to 60 in., 62.2 in. to 65 in., 65.2 in. to 70 in., 70 in. to 75 in.

(22) The great advantage of a variation in tread would be most apparent on a soft or dirt road, for even if a hole or rut were temporarily formed the other following treads would "knead" it out more or less smooth again rather than increasing the depth.

(23) **Fixing Body to Chassis.** The fastening of the body to the frame should also be greatly improved and it should be so fixed that it may be easily and quickly removed and if necessary changed from a touring to a sedan, limousine or other type of body and arrangement made for lifting the body off and suspending it when the other body is substituted. Different conditions and times make it highly desirable and necessary to have either an open or closed or other type of body.

(24) The three-point type of suspension of body would also be highly desirable so as to protect the body from all the warping and bendings of the frame, and if this is done the body can be much more lightly constructed, besides being cheaper to make. The frame cannot be made that will not warp and it is absurd to try and prevent this by bracing the body to it.

(25) **Squeaks and Rattles.** Probably many of the squeaks referred to by Mr. Anglada are spring shackles, pins and leaves of springs and will always exist as long as the springs are exposed to dirt and dust and not properly enclosed and lubricated. The way to overcome the exposure would be to enclose them in a hollow frame, which can be easily and cheaply done, and then all these

can be continuously fed by oil and thoroughly lubricated, and would be entirely out of sight and add greatly to the appearance and simplicity of the entire machine.

(26) **Riding Qualities of Cars.** The riding qualities of all cars should be greatly improved and the amount of vertical motion of the body greatly reduced or eliminated. Any form of suspension that allows the body to deflect downward 4 in. more or less and rebound 8 in. when the wheels fall into a hole 1 in. must be eliminated and the body prevented from surging and vibrating back and forth for an indefinite period until it finally comes to rest and this initial deflection and rebound of flat metal springs can never be effectively prevented by shock absorbers. What is wanted is to absorb the shock instantly and "damp" out the vibration.

(27) This could be accomplished by the pneumatic tire itself on an absolutely smooth road (as smooth as the surface of the railroad rail) provided the air pressure was low enough, say 20 lb., but this is impractical as even if the tires would stand up the pressure is too low for safe steering of the car. On any smooth cement road, when the springs are not in motion the riding is satisfactory.

(28) To "damp" out greater shocks or vibration a secondary and lighter air pressure is required to suspend the body and frame pneumatically, just as the springs now suspend them, and this can be accomplished by an oval-shaped tire of standard section (but without built-up tread), completely surrounding the axle; at 20 lb. pressure. This will allow sufficient motion to the body and instantly check it and prevent all vibration.

(29) This pneumatic suspension would be much lighter and cheaper than the springs, shackles, pins, etc., and eliminate at least 100 parts. Triple pneumatic suspension could be obtained by using pneumatic air cushions with a still lighter air pressure 10 lb., utilizing, say, 60-20 and 10 lb. and giving an ease of riding and comfort that is not obtainable with any other method of suspension.

(30) These pneumatic frame suspension tires would also take up all horizontal road shocks and pneumatically cushion and absorb them, as well as dispense with all torque and radius rods and give a simple and ideal Hotchkiss form of drive.

(31) **External Brakes.** The most surprising thing about American cars is that, with a single exception, all are fitted with external contracting brakes, which are universally recognized as about the worst possible construction. It simply shows that force of habit beats competition and common sense and good engineering every time. Fortunately none of the designers of trucks have ever been guilty, but have invariably used internal expanding brakes arranged side by side and how any engineer or designer, especially of the more expensive car has ever had the temerity to continue to offer external brakes is beyond comprehension. The lives of the occupants depend on the brakes and it would seem that these require as much protection as 5 tons of coal.

(32) The external brakes are always covered with mud and dirt and all pins, etc., quickly wear out, as well as the soft braking material used. They are always out of adjustment and are loose or dragging 75 per cent of the time. It is bad enough to use soft braking material on an inside brake, but to use it on an outside brake is almost a crime. Imagine a railroad engineer substituting a soft-braking material for the metal to metal car brakes, and yet the railroad brake runs under relatively good conditions.

(33) There should be no more difficulty in arranging internal brakes side by side in a touring car than in a truck. Excessively wide brakes are not required, as it is

easy to make the drums of large diameter and again the brakes need not completely encircle the drum, but can be arranged to overlap or pass by each other.

If the adoption of four-wheel brakes would eliminate the external brake it would be the best thing that ever happened to the American car.

(34) **Pedals.** The pedals should normally stand flush with the incline of the foot board and should be the form and shape of the foot or like an organ pedal and when declutched or braked should depress below the fixed floor board and which, if necessary, should have a depressed lip or edge around the pedals. The foot is then always in a normal and easy position on the pedal and is instantly ready to slightly extend to declutch or brake without any lateral movement of the foot and will operate in one-fifth the time required when the foot is not on the pedal as at present.

(35) **Foot accelerator.** The present arrangement of the foot accelerator is very dangerous, for if the foot slips off the pedal and strikes the accelerator it opens the throttle wide and makes the car jump ahead and may cause a serious accident. It would be better if the action of the accelerator was reversed then it would stop the car. Pushing the other pedals stops the car and this should apply to the accelerator as well.

(36) In the form of pedal suggested above, the accelerator could be arranged within the right pedal so the foot would always be upon it, and by slightly elevating the front of the foot the throttle valve would be opened and when returned to normal position the throttle closed to any degree desired, and when the accelerator and right pedal was further depressed the accelerator could be arranged to pass into a neutral zone and not completely shut the throttle or further affect it.

W. J. P. MOORE.

Improved Engine Cooling

Editor, AUTOMOTIVE INDUSTRIES:

S. D. Heron, in the "Forum" in the July 7 issue, does not specifically mention the comments that I made on "Water and Air Cooling" in the Engineering Number. However, I have the good fortune to be very well acquainted with the views of G. J. Mead, and believe that we are in fairly close agreement.

I believe that almost every engineer has a feeling that direct air cooling is logical, particularly for aviation. A few years ago there was a general belief, amounting to much more than a mere feeling, that air cooling would rapidly become universal for aviation. Probably the development of air cooling for motors was to some extent hampered by the war, because the water cooled engine was easier to build for the simple reason that more was known about it.

I believe that Mr. Mead and Mr. Pierce in their papers did not intend to do much more than compare the best air cooled engines of the present day with the best water cooled engines. In my brief article I tried to point out that while air cooling was admittedly going to be improved, there was also considerable scope for the improvement of water cooling.

The case seems to be analogous to that of the two-stroke cycle. Theoretically the two-stroke cycle has many advantages. Practically, twenty years and more of experimenting have not sufficed to make the two-stroke competitive with the more complicated four-stroke engine.

No open-minded engineer would ever say he believed the two-stroke engine would never be perfected. It can be regarded as one of those problems which is intensely stimulating but exceedingly difficult of solution. It is doubtful whether either air cooling or the two-stroke engine are

waiting for any great invention. To bring them to practical commercial perfection calls for a lot of petty experiments rather than for the discovery of new systems.

Cooling as an automotive engineering problem has been given extremely little attention by comparison with the labor which has been lavished on other details of the automobile and airplane. I expect to see both water cooling and direct air cooling steadily improve. Improvement in one will stimulate improvement in the other system. Mr. Heron very rightly says that "enthusiasm is a primary necessity for success in most mechanical fields of investigation." The enthusiasm which seems most desirable is the enthusiasm for *improved cooling*. If this be the ideal, then it can be worked out either in terms of direct air cooling or in terms of water cooling, or a possibility which is very seldom considered but quite alluring—a combination of both systems. There are just a few among us who can remember De Dion's tricycles of 1900 with air cooled cylinders having water cooled heads and valve chambers. These carried a very small quantity of water but they cooled wonderfully well.

A. LUDLOW CLAYDEN,
United States Cartridge Co.

Possibilities of the Air-Cooled Aircraft Engine

Editor, AUTOMOTIVE INDUSTRIES:

I have read the article by Mr. Heron in the "Forum" of the July 7 issue of AUTOMOTIVE INDUSTRIES, in defense of the air-cooled aircraft engine, in response to the paper by Mr. Pierce and myself, read at the S. A. E. summer meeting.

It seems that Mr. Heron's principal criticism was that we had overlooked the fact that much better air-cooled engines could be built. Unfortunately, he did not, apparently, understand one of the premises of the paper; namely, that it was dealing with the actual performance of existing engines. I entirely agree with Mr. Heron that there is a possibility for considerable development of this type of engine. I will, however, take up the points in the order they were discussed in Mr. Heron's article, with the hope that our ideas on the subject of the air-cooled type of engine may be more clearly set forth.

(1) **Parasitic Resistance.**—The statements in regard to the parasitic resistance were based upon a mathematical consideration of a large radial of 375 hp. and approximately 50 in. in diameter. The values derived were stated in Table 1, as compared with those of a water-cooled, V-type engine of similar power. The conclusion drawn from the figures was that a ship with the air-cooled engine would have a loss in high speed of some 5 per cent compared with the same ship with a water-cooled engine. As Mr. Heron says, there are no figures from actual performance available, at least not to our knowledge. It seems reasonable to suppose, however, that an engine with such a large frontal area would require additional power for its propulsion through the air at a speed corresponding to that of another engine of equal power with less frontal area in the same ship.

Smaller radial engines, by that I mean smaller in diameter, 40 in. or under, will not be subject to this criticism, since they fair into the fuselage very nicely.

(2) **Vulnerability.**—Our information on this subject and Mr. Heron's seem to differ somewhat. The consensus of opinion of some of the pilots who were on the western front seemed to be that more planes came down because of being set on fire than because of injury being done to their cooling systems.

(3) **Mean Effective Pressure.**—Our paper stated that

relatively low mean effective pressures had been secured so far in this country, which was correct at that time, I believe, and did not discuss the probable mean effective pressures that could be secured. The mean effective pressure of 120 lb. mentioned by Mr. Heron was only very recently secured with a single experimental cylinder, I understand.

(4) **Temperature Control.**—It is a more difficult problem mechanically to control the temperature of an air-cooled engine than of a water-cooled engine, which, I believe, will be granted. Whether or not it is necessary to carefully provide temperature control has yet to be proven.

(5) **Weight.**—Attention was drawn to the fact that, so far, air-cooled engines weigh very nearly the same, per horsepower, as the best water-cooled engines, complete with water and radiator. Mr. Heron himself makes the statement that successful air-cooled cylinders have proved to be fairly heavy. For that reason it is necessary to increase the mean effective pressure in order to make these engines capable of competing with water-cooled engines in the 400-hp. class.

In conclusion, the whole radial air-cooled situation, as I see it, is as follows:

Whether or not large radial air-cooled engines are to supplant or compete with water-cooled engines depends first upon developing cylinder constructions, which will permit of high mean effective pressures, and also to develop the mechanical parts of the engine so that they will be sufficiently durable for the service expected of them. I see no reason why air-cooled cylinders will not be developed which will give high mean effective pressures. Naturally, there is a great deal of careful experimental work to be done before the maximum efficiency of this type of cylinder can be obtained. Mr. Heron himself is doing some very conscientious work on this problem and undoubtedly in the near future will be able to tell us of the cylinder limitations. In the meantime, development work must be carried on with the mechanical parts of the engine, including the crankcase, crankshaft, connecting rods and valve gear, since in this type of engine the designer is seriously limited by the inherent compactness of the type in securing the proper strength and accessibility, as well as durability, of its various parts. With the cylinder and crankcase assembly satisfactorily developed, we will be ready to determine the advantages of this type in flight, which will involve testing its ability to work under various conditions of temperature, the powers available at various altitudes and the advantages in maneuverability due to the compactness. There is a great deal to this whole problem, and I am glad to say that it is being attacked with enthusiasm both by the Air Service and by individual engine designers in this country.

GEORGE J. MEAD, Chief Engineer,
Wright Aeronautical Corporation.

THE Customs officers in Flanders have, it is announced, recently captured one of the very latest type of armored motor car in use among the smugglers on the Franco-Belgian frontier. It is a large truck, the front part being protected with heavy sheets of steel. In front of the radiator is a contrivance which looks rather like a snow plough, but which is, in fact, a steel bar intended to cut through obstacles placed across the road. The Customs officers who captured the vehicle only took it after a hot fight, in which firearms were freely used. More than 7000 packets of tobacco were found in the lorry, vehicle and cargo representing a total value of 45,000 francs.

Increasing Individual Efficiency Through Decentralized Responsibility

Accuracy of information is not an end in itself. The information must result in time saving or waste elimination in proportion to the cost of getting the accuracy. As individual responsibility increases, the need for system decreases in proportion.

By Harry Tipper

IN the building up of the centralized systems of operation in industry to-day we are in danger of forgetting that the object of industry is to produce a salable article in accordance with the requirements of the market and to sell that product at a profit.

It is desirable to standardize operations, because by this method of standardization and repetition the products can be made more cheaply and in a much greater quantity in a given time.

It is desirable that the records involving the cost of the operations, the materials required in the operations and all the elements entering into cost shall be determined, with sufficient accuracy to facilitate the reduction of waste and improve the productive capacity.

Some of my friends in industrial pursuits have shown me the accuracy of their systems and have dilated upon and emphasized the accuracy as though the whole aim and end of a system was to produce accurate information.

Unless the accuracy of the information permits of saving in time and motion in proportion to the cost of discovering the accuracy, it is not worth while and it may result in a burden upon the business for which there is no concomitant return.

The human error cannot be entirely eliminated. It is not reduced by accurate information, but the information will enable the intelligent man to see where the error might be reduced and to take such steps as are necessary to secure its reduction.

Departments in industry that are concerned with the keeping of records regarding materials, the movement of materials, the cost of operation, the inspection of materials and the fabricated product, time studies and other matters, have a tendency to lose sight of the main object of the factory and to believe that the justification of their own work arises from the accuracy of a record and not from the usefulness of the information itself.

It is quite possible, and, indeed, is not unusual, for a slightly increased degree of accuracy to cost a great deal more money in record keeping, just as it does in shop operations.

Production men know well that a decrease in the tolerance allowance when it gets into the minute fractions increases the cost of the operations very materially and is not to be considered unless its importance is established and its usefulness thoroughly justifies the additional expense.

Similarly, in the records which are kept of the various factors which enter into operating wastes and costs, a certain degree of minuteness will cost so much more to determine that it is not worth while unless the usefulness of the information is very well established and its importance in the operating calculations justifies the additional cost of securing it.

All systems of this character tend to grow faster than the business with which they are connected and tend toward an increased cost in their operation beyond that which was originally or reasonably contemplated.

The same things have been discovered in systems of office practice many times.

A friend of mine who was very much enamored with the creed of accuracy in his advertising work had a most wonderful system for following up the inquiries received so that accurate information would be secured as to what happened to them, what they were worth, and so forth, until they could be considered as dead or completely sold. Products sold by his company entered into a number of industries and were used for a variety of purposes, so that the volume of inquiries was considerable. It required a very large force of people to follow these up and see that accurate records were kept of all the intermediate information and the final information.

One day somebody inquired as to the value of all this work, how much it actually forwarded the sale of the articles to those inquiring and to what extent it was justified by its effect upon the sales conditions. The result of that examination was the elimination of about two-thirds of it as unnecessary and not justified by the extra usefulness involved in its calculations. Apparently very little was done with it when it was secured, and the cost of getting it was very high.

The advantage of system is to increase the usefulness and the advantage of accurate information is to determine the wastes and to indicate the prospects of further use. Beyond this there is no special advantage of carrying into extreme detail the records, except in the research laboratory, where minutiae is of great importance.

The constant reference of all matters to the systematic development of information and records has a tendency to increase the slavish following of rule and precedent which is responsible for the lack of efficient judgment conspicuous in much of the business operation of to-day.

In one of the plants where they make automobile bodies and have a very large run of one type for one concern, one of the operations in the finishing line is the riveting of a particular piece in a certain part of the body. This operation had been performed for a long time on this particular type of body by a worker whose sole job it was to handle this rivet. In the course of time the manufacturer changed the design of this body somewhat, putting the rivet one inch farther up. For weeks the man on the job automatically reached to the old place, and it cost more for the adjustment of his errors than the work of riveting.

Because he had been on the job, considerable patience

was exercised in the attempt to get him started along the new lines, but finally the foreman solved the problem by making a board one inch high and getting the worker to stand on it. The man's judgment, his capacity for adaptation and his whole mental and physical skill had become so specialized in one direction and so atrophied in other directions that he could not accommodate himself to this slight difference in this operation even in a number of days.

There are many men who are engaged upon the work of keeping records, systems, etc., for factories who are just as incapable of thinking outside of their line of work as this man. Their judgment is lost, as far as its flexibility is concerned, and beyond the rules and precedents governing the matter they are without any means of adapting themselves or their work to any slight change in the conditions.

From the examination of many industrial establishments in the last few years and a consideration of the supervisory costs, methods and systems, I am rapidly coming to the opinion that we are over-systematized in most industries; that we have almost forgotten the reason for system, and the systems themselves have reached the point where a good many of their detail developments are no longer useful and may be detrimental to the process of production.

Personally, I think it would be an excellent thing to check the value of the systems by finding out what the foreman and the workman think of it as far as it affects their department. The man who does not run a machine, the man who does not handle the material and is not responsible for getting the work out is not likely to be able to distinguish the essential features of a system of records or operations from the unessential features. With him every precedent is as important as every other precedent and every rule as important as every other rule.

The old-time foreman frequently kept his records of material on pieces of paper stabbed on a file and his drawings of his shop plan of work were not accurate drawings. Nevertheless he was a good foreman, a better man in his day than many foremen at present. Almost always he knew what things were and where they were. His method of cost keeping was not so accurate, but his knowledge of costs was pretty thorough.

It may be necessary for us to decentralize our systems, give the foreman the tools of the system, make him responsible for the working out of these things in his own department in order to grow efficient foremen and to keep the systems down where they are 90 per cent useful and not merely 90 per cent accurate.

Unemployment Statistics

THE status of the unemployment problem in some of the European countries is digested in a recent issue of *Labour Overseas*, a British government publication. The proportion of unemployed to the total population in some of the chief countries on January 1 was as follows:

Germany	15.0%
Belgium	9.6%
Norway	8.8%
Denmark	2.3%
United States	2.2%
Netherlands	1.5%
Switzerland	1.1%
Sweden	0.6%
Czechoslovakia	0.4%
Italy	0.3%

While the figures for France and England are not con-

tained in the digest, so that a percentage could be figured, the following statement is made: "In France there is serious unemployment in the textile and metal trades; at Paris 100,000 persons were said to be totally unemployed in November and at Marseilles 30,000 in January. Unemployment has also affected the British Dominions and Japan to an extent which is at least greater than is usual in normal years."

The situation in England itself is known to be very serious at the present time.

In reading the above percentages it should be remembered that the percentage of unemployed to the total population is given and that only one in five can be counted as a constant wage earner. Had the percentages been figured on this basis they would have been much greater, of course.

Metal Coatings as Rust Preventives

EXTENSIVE experiments with zinc coatings are reported on by Dr. W. Lange in the *Zeitschrift für Metallkunde* for April. Four processes are dealt with, namely, electro-plating, dipping, sherardizing and spraying (Schoop process), which were investigated during the war at the instance of the army research department. Tests were made on small plates of wrought iron measuring 1.2 x 1.8 x 0.16 in. These plates, protected by the different processes, were subjected to the influences of distilled water, hydrant water, and a one-half per cent salt solution, as well as to the influence of the weather, partly in a humid atmosphere containing much carbonic acid gas.

After commenting interestingly on the different processes, the author reaches the conclusion that rust protection is approximately the same for all processes, if they are properly applied. Unsatisfactory results can practically always be traced to too thin a coating of zinc. One pound of zinc should cover from 200 to 380 sq. ft. When well applied, a coating of zinc gives protection against atmospheric influences and hydrant water for a considerable

period. But the protection against a one-half per cent salt solution lasts for only a short time. It follows that protection against sea water is also quite ineffective. The method of zincing best suited to any particular object depends on the form, cross section and the surface formation. For hardened and hard drawn objects, such as springs, steel wires, etc., plating, spraying and possibly sherardizing at low temperature may be used; for strongly profiled objects, objects with deep hollows, and steel pipes, dipping and sherardizing are recommended; for objects made to measure whose limits must be retained, plating and possibly sherardizing; for material on which further work must be done, like sheet metal, plating and dipping; for parts with seams and rivets which are to be made tight at the same time, dipping and spraying; for cast iron objects, spraying.

The life of the different coatings can be greatly increased if the zinc is covered with a coating of resinous lacquer or water glass as a protection against atmospheric influences.



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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly) July, 1907.

Tractor a Lusty Youngster

NINETY firms manufactured 203,207 tractors, worth \$193,563,000, in 1920. Of these tractors, 162,988 were sold in this country, at a value of \$161,896,000, and 29,143, valued at \$30,850,000, were exported. This is quite a remarkable showing for an industry which really dates its activity from 1914. Prior to that year the development of tractors was almost entirely along the line of large machines, which reached their peak of production in 1912, when 11,444 tractors were manufactured. The next year the number was fewer. The tractor had a small sale because it was available only for large farms. In 1913 the Bull tractor, the small farm pioneer, was brought out and this tractor sold in considerable numbers in 1914. Since then the development has been rapid.

It is worth mentioning that the value of the tractors manufactured is a considerable part of the farm equipment business, as the total for this industry, as given by the Department of Agriculture, is \$536,945,000. During 1920 only fifteen firms are reported as manufacturing steam traction engines and these

firms turned out only 1766 engines, worth only \$4,661,000.

Reliable figures of production and sale since 1916 are available through the United States Department of Agriculture, as follows:

	1916	1917	1918	1919	1920
Manufactured	26,670	62,472	132,697	164,590	203,207
Sold in U. S.....	27,819	49,504	96,470	136,162	162,988
Sold for export.....		14,854	36,361	19,893	29,143
On hand Dec. 31.....		15,525	15,401	27,740	16,076

The Vacation Problem

A NEW name for a somewhat old practice is seen in the announcements of factory shutdowns this year. In former years factories have been closed for certain periods "for repairs" and for "inventory" and for other reasons. This year some factories are closing for a week or more "on account of efficiency vacation."

The factories that are doing this are plants which give to their employees a vacation under pay. Previously it has been the custom to permit the employees to arrange vacation schedules that permit the more or less efficient operation of the plant. But this year several firms are announcing that the entire plant, including office, will be closed for one week, with the exception of a small force to answer emergency mail and to make emergency shipments. After the plant has been closed for the vacation period, everybody will come back refreshed and get to work again. One Brooklyn plant, which pays employees for two weeks' vacation period, has caused half of this vacation to be taken by closing the factory on Saturday mornings and the other half is taken through a full week shutdown.

Profiting by Unsuccessful Experiments

HOW many engineers, even those with long experience and records of exceptional achievement, have had so-called "bright ideas" which when put to practical test have failed to materialize because of some unforeseen or seemingly insurmountable obstacle? Every engineer can recite experiences of this kind, many of them accompanied by long periods of what may seem to be fruitless research or development work. The experience gained by learning what is not desirable or attainable is, nevertheless, instructive and correspondingly valuable. Furthermore, it frequently happens that the information gained is or would be, if made available, of great value to other investigators, either in serving as a foundation upon which to build further or in showing what is not possible or commercially feasible. Again, two heads are often better than one. What may seem an insurmountable obstacle to one engineer may be circumvented or eliminated as a result of the experience of another.

For these and other reasons it would be a fine thing if engineers would regard it as one of their duties to report the results of investigations which they have occasion to make, whether directly profitable or otherwise. This is done in an unsystematic way in some

instances, especially when the investigation has proved a highly profitable one, but the idea might well be carried further. The Society of Automotive Engineers and other engineering organizations have accumulated much useful data in their transactions, but these represent but a small fraction of the useful engineering information that can and should be brought together.

We understand that the S. A. E. Research Department has in mind collecting and indexing all published material bearing upon automotive engineering. It might well go further and solicit from its members and others data of equal or perhaps greater importance accumulated through research efforts the results of which have never been published but which are filed away where they serve no useful purpose.

Talk to Your Congressmen

APPARENTLY the Republican majority in Congress is subject to pressure from those who placed the legislators in their present positions. This is indicated by some changes that have been made in the Tariff Bill and by the heed the Senate gave to the President's message on the soldier bonus.

This is as it should be, provided the proper persons speak the sentiment which reaches the legislators. So far it seems that much of the influence has been for good, but the legislator is never quite safe on a business program. Already the legislators have put oil on the free list, which is quite pleasing to the automotive industry, but it might be well to encourage them to keep oil where it now is. It might be possible for a change to be made in the aluminum duty if proper representations were made to the legislators.

Most of all, however, the automotive industry is interested in the carrying out of the Republican promises of a business administration, the lessening of taxes and similar movements. It will pay manufacturers to demonstrate that it is better politics to legislate for business than directly for political support.

Car Resistance Factors

IN the S. A. E. paper by Mr. James, read at the summer meeting, the various resistances encountered by a road vehicle were enumerated, and constants were given by which each could be evaluated. In the case of air resistance a number of authorities were quoted, which differed considerably among each other, and it was pointed out that the highest constants were probably somewhat too high and the lowest too low.

It is doubtful whether any experiments have ever been made directly on an automobile to determine the air resistance at different speeds and to calculate therefrom the proper air resistance constant. S. F. Edge once determined with a car having a windshield the maximum speeds of which the car was capable with different windshield areas. However, as the projected area of the car without windshield, the power curve of the engine, the gear reduction and wheel diameter were not given, it was impossible to make use of the results in determining the air resistance constant.

That the constant found for flat surfaces moved straight against the air is not directly applicable to automobiles is obvious, because streamlining has quite an important influence on the air resistance, and the modern automobile body is to quite an extent streamlined. The constant for an average car body should, therefore, be smaller than the constant for a plane surface. On the other hand, there is a power loss in automobiles running at high speeds which is usually not taken into consideration and which undoubtedly varies with the speed in about the same way as the air resistance loss; namely, that due to road shocks and resultant slippage of the wheels on the road. When going at racing speeds, the driving wheels are out of contact with the road a considerable portion of the time, spinning around idly, and when they strike the road again the tires usually slip more or less until the pressure between tire and road has become nearly normal. That this action is the cause of great power loss is obvious from the experience of every driver that it is almost impossible to make any great speed on rough roads.

If this loss of power, which increases with the speed much faster than the tractive resistance loss and probably in about the same proportion as the air resistance loss, be added to the latter, then the highest values which have been given for the air resistance constant would undoubtedly be nearly correct. It is realized, of course, that the loss spoken of does not depend directly upon the exposed area of the car, but upon the total weight and the ratio of unsprung to total weight; but inasmuch as the shape of car bodies tends to become standardized, there is a fairly definite relation between exposed area and total weight.

Educating Dealers

IT is interesting to hear factory sales managers discuss the necessity of educating the dealer and then to follow the way in which this education is carried out. It is easy to write "enthusiasm" material and it is easy for the dealer to react favorably to such material when times are good, but the general reaction during depression times is likely to be extremely unfavorable.

In either good or bad times, greater progress is likely to be made by fact-education. Not that inspiration is not an essential of good salesmanship. But an analysis of automotive selling indicates that there has been an excess of inspiration and a lack of merchandising analysis. Cars and trucks must be sold in the future on a basis of sound marketing studies. Every party concerned must do his part in gathering and correlating data. True dealer education will concern itself with talking to the dealer along these lines. Excellent results can be obtained by creating a "fact atmosphere," by emphasizing the necessity for study and analysis along selling lines. Automotive merchandising has never been short of enthusiasm and inspiration and those desirable qualities will not be lost if emphasis is removed from them temporarily. Several companies which have already started work in merchandising analysis are already profiting by the results of their efforts.

Sharp Criticism for British Makers

Increasing Imports Deplored at Meeting

Combination of Standard Makes for Export Advocated at Heated Conference

By Cable to AUTOMOTIVE INDUSTRIES
LONDON, July 25.—The conference here of British automobile manufacturers with British motor car dealers throughout the world resulted in sharp criticism of the shortcomings of British makers and their products from the viewpoint of overseas users.

Government spokesman deplored the increasing imports revealed in the striking trade returns, and advocated a combination of the standard British cars to go after business in overseas markets.

A spokesman for the manufacturers contended that while wages remain at the present levels, British makers cannot hope to compete successfully for foreign trade.

Dealers from all parts of the world told some homely truths which resulted in a proposal to hold a meeting under the auspices of the Board of Trade to discuss requirements for cars for export, probably on American lines.

Overseas critics averred that American cars are better than British, and asserted that claims of superior quality for the price in British makes were not well founded.

A spokesman for India resisted heatedly the claim that British vehicles give a greater mileage per gallon of gasoline than American cars.

The general impression is that the conference failed of its purpose, chiefly because of lack of adequate publicity. Editor Goddard of *Motor Export*, a monthly publication, who recently toured the British overseas market, asked the traders present for information concerning the needs in these markets and declared that British makers are slack in their publicity methods.

STATE TO FIGHT OIL PRICES

BUFFALO, July 25.—The district attorney of Erie county has declared he proposes to take retaliatory action against the Standard Oil Co. which he accuses of "maintaining a high price for gasoline in the face of declining prices for crude oil."

NATION'S PRODUCTION 87% OF 1920 IN 2ND QUARTER

NEW YORK, July 25.—Production of passenger cars by the automobile manufacturers which are members of the National Automobile Chamber of Commerce for the second quarter of 1921 was 57 per cent of the production by the same companies for the second quarter of 1920.

Ford production for the second quarter this year was 137 per cent of the same quarter last year.

Production for the industry as a whole in the second quarter of 1921 was 87 per cent of 1920.

Production by the N. A. C. C. companies for April, May and June was 107 per cent greater than for January, February and March.

Production by truck companies which are members of the N. A. C. C. for the second quarter this year was 39 per cent of the second quarter of 1920. It was 34 per cent greater than for the first quarter this year.

Tire Exports Greater, Akron Makers Report

AKRON, July 26.—Akron tire manufacturers report heavier export business so far this year than at any time in the history of the tire industry. The volume of export business has practically doubled since the first of the present year. As indicative of the steady return to stable economic conditions in Europe, tire manufacturers report European export business increasing rapidly.

Mexico and South America continue to lag in export of tires, largely due to the fact that merchants in these countries have refused to write off their losses and are holding for war time prices, according to export managers of the "Big Four" of Akron, the Goodyear, Goodrich, Firestone and Miller Companies.

Goodrich recently has organized a separate or subsidiary export corporation and has established offices in Akron. Firestone this week has transferred its export departments from New York to Akron so that export managers can keep better in touch with the home office and can handle export orders directly out of Akron. This transfer brings G. T. Currier, F. C. Allen, W. H. Snyder and G. L. Livingston to Akron from the Firestone export office in New York, with L. A. Latour remaining in charge of the Firestone warehouses in New York City.

Tire Exports Nearly Doubled in England

Otherwise Shrinking Market Brighter by Cutting Down of Rubber Import Value.

LONDON, July 15 (By Mail)—The best that can be said of Britain's automotive trade returns—export and import for June—is that the end of the month marked the near cessation of the protracted period of British labor troubles. The cloud seems completely to have lifted with the decisive vote of the engineering unions—comprising some 30 and more affiliated bodies—in favor of accepting the wage reduction proposed and discussed between the masters and men some weeks before.

As to imports, during the month 602 cars and trucks and 391 chassis were imported, the combined value (at pre-war exchange rates) being \$1,344,360. The value of parts imported was \$626,620 and of tires imported \$1,144,005.

British vehicles exported numbered 166 and chassis 43, the combined values being \$938,740 and the value of exported parts was \$484,645 and of tires \$555,315.

The six months' totals were: Imports, vehicles and chassis, 6,619 as compared with 25,521 in the corresponding period of 1920; parts (value) 9,020,390, and tires (value) \$7,783,585 as compared with \$18,410,645 and \$12,582,440 in the like period of 1920.

British exports for the six months—Vehicles and chassis, 2,340 compared with 2,533 in the like period of 1920; parts (value) \$3,888,830 against \$4,244,615 in the like period of 1920, and tires \$16,088,030 against \$5,990,170 in 1920.

It will be noticed that while there has been a notable shrinkage of imports and exports generally during the six months, the export value of British tires has nearly doubled and the import value of tires has been nearly cut in half.

The interesting point here is that imported tires are duty free, yet the British tire trade is constantly urging that they should be taxed on the plea that British interests suffer and British workers would benefit by increased production following (it is hoped) the fall off in imported tires.

ELGIN MAKES RECORD

ARGO, ILL., July 25.—The Elgin Motor Car Corp. has informed its dealers that the number of cars shipped for the month of June was 102 per cent larger than for any other one month in the past seven. Orders June 1 were 259 per cent greater in the same period.

Rickenbacker Turns Manufacturer

American Flying Ace Plans \$5,000,000 Firm

Backed by Walter Flanders and
B. F. Everit—Files Charter
Application

DETROIT, July 26—Capt. E. V. Rickenbacker, America's ace of aces, is about to enter the ranks of American motor car manufacturers, backed by Walter Flanders and B. F. Everit. Application was filed at Lansing yesterday for a charter for the Rickenbacker Motor Co., a \$5,000,000 concern backed by a group of automobile men which is of unusual strength and resource.

This is not the first time that Flanders and Everit have been associated as they were two members of the old E.M.F. group which later became the Studebaker Corp. The other name was that of William E. Metzger, who was the "M" in the combination. This organization looms large in the history of automobile manufacturing activity as one of the first to manufacture a low priced car in large quantities.

Since the sale of the E.M.F. concern to Wall Street interests, Everit has confined his attention entirely to his original business of automobile body building and he is to-day the second largest body builder in the world.

The name of Flanders is familiar to everyone in the automotive industry. He took over the defunct United Motors Co. from which he created the Maxwell Motor Co., of which he was head from 1911 to 1920. During that time this organization earned \$18,000,000 in profits, having started from what was known as a pile of scrap. Flanders has continued to insist up to this time that he was going to remain in retirement and in fact made this announcement in Detroit not more than ten days ago. Those well informed in the industry always have believed, however, that Flanders would come back.

Rickenbacker stated to-day that the design of his car was started over two years ago when he returned from Europe determined to enter the automobile manufacturing business. He states that the design incorporates many points learned through his own long experience in the automobile field and that of his associates.

As it now stands the organization includes Everit as president and general manager, Rickenbacker as vice-president and sales director, Harry L. Cunningham as secretary and treasurer. The other directors are Flanders, Carl Tuchenor, Roy Hood and E. R. Evans.

Cunningham is one of the closest men

(Continued on page 193)

COMPETITION SO GREAT TRAINS GIVE WAY TO MOTOR CAR

NEW YORK, July 26—An effect of automobile travel on railroad operation is shown in the decision of the Interstate Commerce Commission authorizing the abandonment of two branch lines of the Boston & Maine Railroad in New Hampshire. One, extending from Cherry Mountain to Jefferson in Cross County, a distance of three and one-half miles, was built in 1892 for the accommodation of summer resort travel. The increase in motor car travel has caused a steady diminution in the passenger traffic, and in 1919 and 1920 the company reported that the average number of passengers per train was three with total freight revenues in 1920 amounting to \$88 and total passenger revenues \$319.

The other branch line extending from Bethlehem Junction to Profile House, in Grafton County, a distance of nine miles, also had to give way to the competition of automobiles, as the report shows that the average number of passengers per train during 1920 was two, with revenues amounting to \$1,713 and operating expenses \$12,940.

Hope for Reciprocal Duties on Implements

CHICAGO, July 25—Although the tariff bill passed by the House has placed imports of Canadian farm implements on the free list, hope is entertained that the Senate will place manufacturers of farm operating equipment in the United States on an equal footing with their competitors in the Dominion, which has an almost prohibitive tariff on farm machinery.

Some manufacturers believe that the tariff bill empowers the President to impose reciprocal duties. Because of the uncertainty which prevails, manufacturers connected with the National Implement and Vehicle Association have authorized their national legislation committee to give full consideration to the tariff question, with power to file a protest if American farm machinery manufacturers are not fully protected.

The section of the bill which relates to agricultural implements does not specifically mention tractors, and inquiry will be made to ascertain whether it is the intention to include them in list of farm machinery to be admitted free.

Sherman Will Direct A.E.A. Sales Campaign

Executive Editor of Class Journal
Co. Resigns to Conduct \$40,000
Promotion Plan

NEW YORK, July 26—Ray W. Sherman, executive editor of the Class Journal Co., has resigned to become merchandising director of the Automotive Equipment Association.

Mr. Sherman will take up his new work Aug. 1, organizing and directing the sales promotion movement authorized at the recent Mackinac Island convention of the A. E. A. His headquarters will be in Chicago, where he will work with the sales promotion committee headed by Robert A. Stranahan, president of the association.

Before becoming executive editor of the Class Journal papers, Mr. Sherman was editor of *Motor World*, which he joined more than nine years ago. Previously he had spent several years in daily newspaper work and for a time was in the advertising department of the Franklin Automobile Co. He was graduated from Syracuse University in 1907.

The work which Mr. Sherman will undertake, with a staff of assistants, is virtually an educational campaign intended to carry a practical message of better merchandising to all branches of the automotive equipment trade. It will call for the co-operation of manufacturers, jobbers and dealers in plans yet to be worked out in detail.

Manufacturers Study Enclosed Car Market

DETROIT, July 25—Automobile manufacturers are beginning to scan the horizon in a study of prospects for enclosed car business in the fall. It is too early to determine definitely the size of the probable demand in September, October and November, and dealers are not inclined to commit themselves.

It is felt among some well posted men in the industry that due to the reluctance of closed body manufacturers to make large commitments for materials there is a possibility of something resembling an enclosed car shortage during the fall. It is felt that when the vacation season is over a larger proportion of the cars sold will be of the enclosed type. It is certain that none of the body manufacturers are over-producing at this time on closed jobs. Manufacturers of cars say they will not be able to formulate plans for production of enclosed models until after Aug. 1, when they will have had a chance to sound out dealers.

Atlanta Territory Sees Trade Revival

July Sales, However, Not Expected to Reach Those of June

ATLANTA, Ga., July 26—In spite of the price reductions effective July 1 and the resultant increase in sales that has been experienced by these various companies during the present month, as a whole July will not be as good a month for the automotive industry in the Atlanta district as June. The outlook for the future, however, is brighter than it has been for a number of months and indications are that automotive sales in this district will have picked up to an appreciable degree by the early part of fall.

A prominent Atlanta banker declares that a thorough investigation conducted recently by his bank leads him to believe that the situation is now on the road to rapid improvement.

"For some time economic authorities have been watching for the trend of affairs that will indicate a revival in business conditions," this banker declared, "and they are now beginning to see its advent."

One of the primary difficulties in the South is the continued and unexpected low price of cotton, which leaves the farmer without ample finances for the purchase of automobiles and almost closes this market entirely as a profitable one for the dealers.

Conditions as a whole, however, appear to be on the upward trend, and virtually all lines of business in this section appear to be noting favorable effects as a result.

Headlight Law in Ohio Takes Effect August 16

COLUMBUS, July 26—The law enacted at the last session of the Ohio General Assembly regulating the glare of headlights becomes effective Aug. 16, which is the time of the expiration of the referendum period. The new law provides that no headlights can be used on the highways and streets of the state unless covered by a lens approved by the Ohio Highway Commissioner. No certificate of approval of lens can be issued until actual tests have been made by that official.

The provisions are that a light shall be used to disclose any persons, vehicle or object for a distance of 200 ft. ahead of the car, and no dazzling rays shall be used more than 3½ ft. above the surface and not more than 75 ft. ahead of the car. No lamp shall be more than 32 candlepower. No spot light can be used except when projecting its rays directly on the ground at a distance of 50 ft. in front of the vehicle and to the right of the center of the roadway. Heavy fines are provided for violation of the provisions of this law.

DIXIE DEALERS OPPOSE PROPOSED GEORGIA GAS TAX

ATLANTA, GA., July 26—The plan to raise upwards of \$3,500,000 per year in the State of Georgia by a special tax on gasoline and soft drinks, and which is now being considered by the State Legislature, will be bitterly opposed by the dealers according to present indications.

The tax on gasoline proposed is 1 per cent per gallon, and this would net the State additional revenue of \$800,000. The tax would, of course, be passed on to the ultimate consumer, but with the country still paying war taxes on most of its luxuries, various dealer organizations are planning to oppose the passage of the measure as an unnecessary hardship.

Savannah Sales Good; Outlook Is Favorable

SAVANNAH, July 26—Savannah retail automobile dealers have experienced a decided improvement in business during the last two months as compared with the first three or four months of the year. June sales and general automobile business showed material increases, as compared with the preceding months, as a result of the reduction in prices, and a slight improvement in general business conditions, in this territory.

However, says Percy S. Bacon, president of the local dealers' association, the June sales are hardly better than the average monthly sales of last year. The first four months of this year were exceedingly bad for the dealers of this territory, but the recent improvement has given the dealers new hopes, and they are putting forth every effort to push sales forward.

Bacon explained that for the past two years the automobile business in Savannah has been greatly handicapped by the construction of concrete roads being in progress, which made long, boggy detours necessary. Since the completion of road and bridge work through this section, forming a direct route from the East, through Savannah and Brunswick into the State of Florida, the local dealers are expecting considerable improvement in business.

Depression in the cotton, naval stores and lumber markets, upon which Savannah and vicinity chiefly depend, has caused tight money and other factors which still prevail to considerable extent. Until these markets recover considerably, normal conditions can hardly be hoped for in this territory. However, reductions in prices by retailers in general have stimulated buying by local consumers considerably, and there is a tendency toward improvement in exports within the next six or twelve months.

The outlook for the automobile business in this territory is very favorable.

July Sales in Texas Show 20% Increase

Dallas, Ft. Worth, Sherman and Waco Report Substantial Gains Over June

DALLAS, TEX., July 26—Conditions in the automotive industry in Texas continue to show improvements from month to month. As the June sales on the part of the retailers showed an increase over those of May so are the July sales showing an increase over those of June. A canvass of a score of retail automobile establishments in Dallas and a dozen in Fort Worth, Sherman, Greenville, Waco and other towns developed the fact that the sales for the first half of July show an increase of from fifteen to twenty per cent over the sales of the same period for the preceding month. Dallas wholesale dealers who are supplying retailers in north Texas, parts of New Mexico, Oklahoma and Louisiana report that sales are increasing over the territory.

The increase in sales of automobiles, according to the local dealers, is due to three things.

First—The marketing of the grain crops in this section of Texas is putting some \$30,000,000 in the pockets of the farmers. This money is getting into circulation and cars are being bought. The fruit and vegetable crop is being marketed and this is bringing some \$20,000,000 more to the farmers of this section. Money is freer, hence cars are being bought.

Second—The reduction in the prices of automobiles. Dealers who have made price reductions, and practically all of them have, say there has been a noticeable increase in sales since the reductions.

Third—It is the touring season and the roads are alive with motorists. More people are using automobiles for vacationing this year than ever before.

Dealers Not Big Losers in Closed Chicago Bank

CHICAGO, July 26—The best information available shows that Chicago automobile dealers who were depositors in the closed Michigan Avenue Trust Co. will not be heavy losers, as their accounts in most cases were small and represented balances carried to meet payrolls. As a consequence motor row is not much concerned.

The Chicago Clearing House committee has issued a statement advising the public that the closing of the bank has no bearing upon general banking conditions, which are sound. Auditors now at work expect to have a statement ready in a few days. The troubles of the bank date back to a deal with the Graff Mfg. Co., which obtained a loan of \$250,000 on the strength of a contract with the Packard Motor Car Co. of New York which later was canceled.

Indianapolis Hopes to Beat July Figures

**Cole Orders Show 45 Per Cent
Gain Over Period of
Pre-Reduction**

INDIANAPOLIS, July 26—As July nears an end, it is evident here that the volume in business will exceed that done in June by a larger per cent than was expected. The greatest increase can be noticed by those automobile companies who have just recently made cuts in prices. The increase at the Cole plant has been noticeable. Since the reduction in prices, orders received at the plant show an increase over the pre-reduction period of approximately 45 per cent. Other plants are able to show increases of from 20 to 30 per cent. Those companies which made reductions earlier in the year are having a steady business, tending, officials say, toward a slight increase. These companies obtained increases immediately after prices were cut and contrary to all predictions here their sales did not slump after the first increase.

Dealers in automobile accessories here appear to be more optimistic concerning business for July and for the remainder of the year than the strictly motor car dealers. In accessories for smaller cars, such as the Dodge and Ford, the shock absorbers head the list. Dealers say that the demand for bumpers, special wheels, spot lights and locks has been good, better in fact than was expected.

Latest bank reports show business in the banks to have increased materially during the past six months of 1921 and savings accounts to have shown more than their proportionate share of increased business. In spite of this fact, Indianapolis bankers are more cautious than usual in lending money.

Automobile finance organizations, which finance the purchaser in a payment plan, appear to have plenty of money at the present time and report that since June 15 much better credit conditions have prevailed. Many accounts which have been past due for weeks have been paid up and payments now are being made regularly. The percentage of non-payment is less than it was this time a year ago.

Turn in Kelly Tire Stock

HARTFORD, CONN., July 25—At a meeting of persons interested in the fate of the Kelly Tire & Rubber Co., Benedict M. Holden explained the status of the company. It was pointed out that the stockholders would be lucky if they got 50 cents on the dollar.

Nathan E. Prince, vice-president of the Hartford-Connecticut Trust Co., has consented to serve on the stockholders' protective committee. This is composed of bankers in New Haven, Waterbury and Hartford. Plans are now being considered as to the best means of protecting the interests of the investors.

DETROIT PLANTS PUT 22,976 MEN TO WORK SINCE MARCH

DETROIT, July 26—Virtually the entire increase in employment in Detroit since March has been in the vehicle and transport group of manufactures. In this industry, which includes the automobile factories, employment increased from 53,205 in February and 81,093 in March to 104,069 in June.

Restrictions of Banks Affect Sydney Sales

SYDNEY, AUSTRALIA, June 14 (By Mail)—The vast majority of would-be purchasers of motor cars in New South Wales are prevented from buying owing to the restrictions banks are now exercising with their clients who owe them money. The banks are pessimistic, but recently a few optimistic notes have been sounded by some bank managers in their annual reports to shareholders. The automobile trade has just finished up its summer business, which under such conditions has established the worst record since 1912, and as a result most of the motor car dealers are stocked with cars. There are a few fortunate ones who have cleaned up their stocks, but there are others who have heavy stocks and it will be twelve months before decent orders are placed for more cars by some of them. The purchasers are still waiting for prices to fall.

During the first two weeks in June the motor trade has been busy discussing the tariff with the Federal parliament of Australia, and it is predicted in some quarters that the import duty on the chassis will be reduced, but that the present duty on the complete car will be continued. An energetic campaign is being waged to get a lower duty on farm tractors and motor trucks. The duty on farm tractors has been considerably higher in proportion to that on automobiles than it should.

Wool, which is one of the staples of Australia, has for over a year come through a very bad period. As this is the biggest revenue producer in the country, this situation is naturally reflected in the buying power of the people.

For months it was impossible to sell a single pound of wool. There were no buyers and no offers. Lately the position has become slightly changed and indications point to a gradual improvement. If such develops it will bring about a decided improvement in business conditions throughout the Commonwealth of Australia.

In New South Wales motor truck business has shown improvement of late, whereas in the remainder of Australia it is practically dormant. Truck improvement in New South Wales is due to the heavy hilly nature of the populated areas.

Car Demand Improves in Columbus Field

**Closed Plants Gradually Resuming—Records Show More
Workers Are Employed**

COLUMBUS, July 26—There is a continued improvement in the demand for passenger cars in Columbus and central Ohio territory. This is the report from dealers and distributors of cars in almost every line. With a number of price reductions announced during July, business in certain makes was still further stimulated. On the whole trade is much better than was expected.

There is a slight improvement in the unemployment situation which is shown by the reports of employment agencies and also from reports received from large employers of labor. Some of the plants that were closed down early in the year are gradually resuming and are employing more men from time to time. Other concerns are still holding their own, and as a result there are fewer men out of work now than was the case a month or six weeks ago. This is being reflected on the automobile trade, especially passenger cars. People are now inclined to take a chance, for it is the belief that the worst of the slump is over and that conditions are on the mend.

But dealers and distributors are not too optimistic and they are proceeding cautiously. The larger majority believe that the improvement will be gradual and they do not expect a boom during the present year. They are working on the principle that a certain number of cars will be sold with things brightening up, and it is up to the dealer to hustle for the business. Consequently, salesmen are being trained to pick up prospects and to handle the prospects after they are secured. It is a long, hard grind ahead of the sales force, and special efforts are being made to keep up as much as possible.

May Modify Ford Offer

WASHINGTON, July 26—Secretary of War Weeks says that Henry Ford's offer for the Government nitrate plant at Muscle Shoals, Ala., is unsatisfactory in its present form. He said that in several respects the Ford proposal was not in the exact form expected, though he thought it likely that modification could be made in the offer when he discussed the proposal with Mr. Ford, which might make it acceptable. The date has been set for a conference between the two.

A. M. E. A. Convenes Oct. 5

NEW YORK, July 26—The annual convention of the American Manufacturers Export Association, which numbers several automotive manufacturers among its membership, will be held at New York on Oct. 5 and 6, and various matters of importance will be discussed.

Automobile Market Depressed in Japan

Imports Close as Yokohama
Sheds Fill Up with Cars
and Trucks

SEATTLE, WASH., July 26—Continuation of the depressed state of the automobile market in Japan has led to stoppage of automobile imports and to the accumulation of large numbers of cars and trucks in the customs sheds at Yokohama, according to the latest reports from the Orient. A partial recovery in retail sales was felt in the first four months of the year, but since then conditions have slumped somewhat and it is now felt that no marked improvement will come until autumn.

Retail dealers in Japan complain that would-be purchasers of automobiles feel that the prices asked for standard makes of cars are too high. The average American or English car sells for an amount in Japanese currency equal to twice the retail price in the country of manufacture. And yet conditions are such that even at this price the automobile dealer in Japan, it is said, can make but a small profit. Transportation and boxing costs add greatly to the cost of the foreign automobile, and the high import duty in Japan is charged not on the original cost of the automobile but on the original cost plus boxing and transportation charges. Transportation, boxing and insurance costs amount to from 15 to 20 per cent of the first cost of the automobile. To this cost must be added the landing charges, an item which has greatly increased in the last few years. Charges for interest on money tied up must also be added.

Consider Own Production

In face of the present high cost of imported cars, home production of automobiles is again being talked of. Several attempts to manufacture Japanese automobiles have been made, and are being made at this time, but so far they have been generally unsuccessful. In one or two instances a small, light car of satisfactory performance has been produced, but the manufacturers have been unable to interest local capital in sufficient quantities, and as a result the production costs have been high, and the selling price has not been appreciably lower than asked for of foreign vehicles of similar size.

Japanese labor is not yet sufficiently skilled or sufficiently experienced to be suitable for use in automobile manufacturing. It is considered that Japan will not be able to produce her own cars and trucks for 15 or 20 years.

The recent passage of the new motor taxes in Tokyo have added to the motorist's burden. One Tokyo writer says that not only is Tokyo content with having the worst roads of any large city in the world, but that it has the double distinction of imposing the highest automobile taxes.

COLE CAR BOUGHT BY KING CONSTANTINE OF GREECE

INDIANAPOLIS, July 26—The Cole Motor Car Co. obtained an order to-day from King Constantine of Greece for a Cole car, all decorated in a coat of arms, nickel-plated fixtures and everything. Before Greece got the king bug the last time, its ruler had a Cole car and while officials of the company do not know whether Constantine requisitioned the car after he resumed the throne, yet he has fallen in love with a Cole car to the extent of ordering one.

Installing Budget System in Goodyear Tire Firm

AKRON, OHIO, July 26—President E. G. Wilmer, of the Goodyear Tire & Rubber Co., who recently succeeded F. A. Seiberling, has put into operation a complete budget system for the entire Goodyear factory and the main offices and all branch offices. The budget plan was adopted following a conference of Mr. Wilmer and other Akron officials, with New York banking interests now virtually in control of the Goodyear company through the \$80,000,000 refinancing program recently negotiated.

Under the system each factory or office department and every branch office has been assigned a specific budget, with the order issued to each departmental manager to hold his expenses within his respective budget for the ensuing year. Heretofore Goodyear has operated without a budget and without a financial board of strategy to pass upon expenditures, new expansions and addition of high salaried men.

Preston Motors Starts Shipments to Europe

BIRMINGHAM, ALA., July 26—Shipments to foreign countries by the Preston Motors Corporation have recently begun according to an announcement by James T. Driver, vice-president and general manager of the corporation.

The first car sailed from New York on the steamer Woodrow Wilson for the distributor of the Premocar in Jugoslavia last Saturday. While only one car was shipped the agency has ordered three carloads more, and they will sail as soon as possible.

Applications for a distributor's franchise have been received from Africa, Australia, England, Germany and many other foreign nations. Just as soon as the production warrants this territory will be closed. The Creel Motor Company, local distributors, have dotted the state with Premocars. A departure from the general rule is shown in the fact that the Premocar is just as popular at home as it is elsewhere.

Cleveland Dealers Predict Good Gains

July Will Be from 25 to 30%
Better Than Average, They
Assert

CLEVELAND, July 26—Basing their estimates on the volume of business done the first two weeks of July, representative Cleveland dealers assert the present month will be from 25 to 30 per cent better than the average July in the past.

Reductions in prices brought an influx of new business that has continued through the middle of the present month in this city. Many owners and others wanting to own a car this year kept holding off for lower prices, until now dealers say the demand indicates that the average man and woman is of the opinion that the last price reductions on 1921 cars have been made.

The Chandler car is now selling at the pre-war price, and the local dealers say that June sales went up surprisingly, and that the first two weeks in July are far ahead, from the standpoint of new cars delivered, of the corresponding period in 1920. This statement is borne out by Samuel Regar, treasurer of the Chandler Motor Car Co. He said that retail sales of Chandler cars throughout the country for June were the largest of any month since October 1920.

The Jordan dealer, who says that his June sales were the best for any similar month in the history of his firm, asserts that July this year is likely to establish a new record.

Reports at the Dodge, Chevrolet, Willys-Knight, Overland, Studebaker, Auburn, Franklin, Hudson and Essex, Stutz and Buick agencies are that July this year is better than the average.

The automobile industry here seems to accurately reflect general business conditions, as portrayed by the Cleveland Trust Co. That bank says:

"Business cycles pass through four separate phases—prosperity, forced production, liquidation and readjustment back to better times. We are now in the third and fourth phases, and while liquidation is not entirely completed, readjustment is under way. When prices are falling the tendency is to get rid of stocks on hand. During this transition industry stagnates, unemployment is general and business is bad, because everybody wants to sell and few want to buy. Such a situation always corrects itself because consumption is greater than production and stocks become exhausted and have to be replenished. Evidence is accumulating that the rapid fall of wholesale prices has stopped."

Stockholders Ask Receiver

EVANSVILLE, IND., July 25—A group of stockholders in the Stronghold Tire & Rubber Co. has filed a petition in the county court asking for a receiver. It is alleged the company is on the verge of bankruptcy.

\$90,000,000 in Truck Contracts Hang Fire

Russian Soviet Officials Who Made Them Under Arrest in Chicago

CINCINNATI, July 26—A few days ago the United States Motor Truck Co. of Covington, Ky., had contracts for \$90,000,000 worth of automobile trucks for the Soviet government in Russia. To-day the company is wondering whether the contracts are good or not.

F. J. Alvin, an official of the company, also is wondering whether his appointment as Director of Standardized Motor Truck Equipment for the Russian government in the United States, also is valid.

The Trailmobile Co., the Highland Body Co., and other Cincinnati concerns interested in automobile building, also are wondering as a result of recent developments in Chicago.

Max Schallman, a representative of the Soviet government, made the contracts and promised Alvin the appointment several months ago. No money was passed at the time and the companies with which contracts were placed, including several not directly engaged in the automobile business, were waiting for the passage of the coin before undertaking the contracts. But the contracts, nevertheless, were all signed and ready, once the money was shown.

Schallman since has been arrested in Chicago on several charges by Federal authorities, in connection with his activities in this country. His attorney says he will carry the contracts as soon as delays, beyond his control, are overcome. These are due to affairs across the sea, it was said.

The firms concerned are up in the air and awaiting definite word on their contracts. Alvin's appointment was to supervise standardized truck manufacture in some 15 or 16 truck plants throughout the country, at which contracts were to be made by Schallman.

It is charged that the contracts were made to get business men interested in recognition of the Soviet government, because of the pressure they would bring to bear on congressmen and senators due to their contracts.

New South Wales Plans \$243,000,000 Road Loan

NEW YORK, July 26—A loan of \$243,000,000 will be raised in New South Wales to carry out the reconstruction of the main roads throughout the State. This report to the Bureau of Foreign and Domestic Commerce states that the loan, which will carry 5½ per cent interest, is being arranged by the State treasurer. The scope of the main roads bill has been enlarged by extending its area throughout the county of Cumberland. Every penny of the huge loan, says the report, will be devoted to the building of good roads.

CIVILIAN AVIATORS FLY 3,250,000 MILES IN SIX MONTHS

NEW YORK, July 26—The Manufacturers Aircraft Association, on completing an aviation survey of the United States, announced today that in the last six months the 1200 commercial planes in operation had flown approximately 3,250,000 miles.

"The record," says the survey, "shows that civilian flying, although embarrassed by the lack of an American air policy, has established itself as a remarkably safe and dependable means of transportation. In three and a quarter million miles of travel by air, only 15 persons were killed and 43 injured in a total of 27 serious accidents. Most of these accidents occurred among that class of civilian aviators known as gypsy flyers.

"Of the 1200 commercial aircraft, probably 1000 are under the indirect supervision of responsible plane manufacturers or transportation companies—and this is absolutely the only regulation over flying, as local ordinances or state laws cannot be enforced. Lacking a Federal organization controlling civilian aviation, these 200 or more gypsy flyers have been permitted to fly at will and many have met disaster."

Stockholders Will Buy Immel Company Assets

COLUMBUS, July 26—The sale of the Immel Co. plant together with all materials and equipment at the other two plants of the company to Arthur G. Gilmore, chairman of the committee of stockholders, has been approved by the court. Steps are now being taken to organize an entirely new corporation to take over the property and operate it for the manufacture of closed automobile bodies, to which purpose the plant has been placed.

A meeting of the former stockholders who have participated in the sale will be called soon, when it is hoped to select a name and to iron out details for the incorporation of the company. All financial matters will also be considered at this meeting. It will probably be weeks before a definite announcement.

Cut Kalamazoo Trucks

KALAMAZOO, MICH., July 26—A general price reduction ranging from \$300 on the lighter models to \$425 on the heavier trucks has been announced by the Kalamazoo Motors Corp., which manufactures the Kalamazoo truck. New prices f.o.b. Kalamazoo range from \$2,495 for the 3000-lb. truck to \$4,800 for the road builders' special 5-ton truck.

British Labor Back; Industry Sees Hope

Automotive Trade One of First to Benefit Big Return of Workers

LONDON, July 10 (By Mail)—The tenseness of the British labor and general industrial situation has subsided more rapidly than it took to develop. The miners have resumed work, the engineers have come to terms and will continue at work pending further discussion, and the cotton operatives have resumed work. Thus the three chief British industries have again reverted to a reasonable course and the fact finds expression in the slogan, "Full speed ahead."

The factor underlying these disputes has been the problem of wage rate and the acceptance of economic necessity of a reduction of cost of production. On all hands the Government is blamed for lack of provision in handling the affair. It "controlled" industry just long enough to suit its purpose, and just as quickly decided to cut the control, with the result that labor and employers were thrown at each other's throats.

The automobile industry will be one of the first to benefit by the resumption of labor, and in a few days the stock of the automobile companies should begin to reflect a hopeful issue.

At present the demand is exclusively for light cars and motorcycles. Big stuff has slumped, so much so, that it is probable one of the big factories would suffice for all the salable output in that category.

Companies to Increase Daily Tire Production

AKRON, OHIO, July 25—The Goodyear Tire & Rubber Co. is preparing to increase production to 25,000 tires and 30,000 tubes a day. Considerable difficulty is being experienced in obtaining skilled tire builders.

The Firestone Tire & Rubber Co. announces that its production will be raised 23,000 tires and 25,000 tubes a day. Substantial increases are reported in orders both from manufacturers and dealers.

NEW YORK, July 25—The Kelly-Springfield Tire Co. is producing in excess of 2300 tires a day at its Akron and Wooster, Ohio, plants, and 700 a day at the new Cumberland, Md., factory. Output at Cumberland is being increased as rapidly as possible. More than 900 men are employed there now, and the number is being increased each week. The production at this plant alone is expected to reach 5000 a day by the end of the year.

BOSTON, July 25—The Fisk Rubber Co. is increasing its production. The output now is running 8500 casings and 10,000 tubes daily.

Cost Cuts Chief Help to Ford Meeting Loan

**Sharp Manufacturing Reductions
Aided Him to "Put It Over"
on Bankers**

DETROIT, July 25—Details of the manner in which Henry Ford overcame the financial difficulties which confronted him early in the year and escaped from the bankers who were waiting eagerly to get a share in his business by means of a loan, have been printed at length recently in the daily newspapers. The salient facts were recounted in AUTOMOTIVE INDUSTRIES some two months ago.

The most striking feature of the story is the sharp reduction made in manufacturing costs. All non-essential jobs were abolished. Late in 1920 the average cost of labor and commercial overhead per car, exclusive of material, was \$146. Now it has been cut to \$93. Formerly 15 men were required per day per car. Now it requires only nine.

Early in January Ford needed \$58,000,000 to pay \$33,000,000 in bank loans which he made to buy the holdings of the Dodge Brothers; \$18,000,000 for Federal taxes and \$7,000,000 for employees' bonus.

He had on hand \$20,000,000 in cash and raised \$24,700,000 by the sale of cars manufactured from parts on hand in the main factory and the assembling plants. He collected \$3,000,000 due on foreign accounts and realized \$7,900,000 by the sale of liberty bonds. Another \$3,700,000 came from the sale of coke and by-products. This left a margin of \$1,300,000 for operating expenses.

The additional funds needed were obtained by making use of the Detroit, Toledo & Ironton Railroad. Before he got control of the road it took an average of 22 days to haul raw materials to the factories, work it up, and get it to dealers. The money tied up in this way stood constantly at about \$88,000,000. This time was cut to 14 days and the amount tied up reduced to \$60,000,000. This left \$28,000,000 for operating capital.

English Firm Acquires Willard Patent Rights

CLEVELAND, July 26—C. A. Vanderwell & Co., Ltd., of London has acquired the patent rights covering the manufacture of the Willard threaded rubber insulated battery for the United Kingdom and British dominions, excepting Canada, according to an announcement made today at the office of the Willard Storage Battery Co. The threaded rubber takes the place of the wooden fiber separators in the battery and makes the battery much more lasting.

The device is the invention of Willard and it has been used in this country for more than a year with such good results that the Vanderwell company sought the right to use it.

SEIBERLING RETURNS TO THE RUBBER INDUSTRY

NEW CASTLE, PA., July 25—Frank A. Seiberling, former president of the Goodyear Tire & Rubber Co., has "come back" to the rubber industry, as his friends predicted he would, after relinquishing control of the huge corporation he built up from the humblest of beginnings.

Under a court decree he will take possession of the New Castle Rubber Co. which he purchased for \$103,000 at a bankruptcy sale some time ago. This price was considered very low, as the factory is well equipped and cost several times that amount.

While awaiting confirmation of the sale by the court, Seiberling told New Castle bankers that he expected to take personal charge and begin operation as soon as possible.

Dealers Fight Georgia Accessory Tax Measure

ATLANTA, GA., July 26—Volney Williams, president of the Georgia Automotive Dealers Association, appearing before the House committee on appropriations and ways and means of the Georgia State Legislature, now in session, told members of the committee that the tax increases proposed by the present assembly on automobile and accessory classifications are too high, and that if the present taxes are increased to any appreciable degree it will have the effect of putting a large number of dealers in Georgia out of business within the next year.

A bill revising the general tax act in the State so as to produce an estimated increase of \$500,000 a year to the State revenue beginning Jan. 1, 1922, has already been introduced before the General Assembly. Wholesale and retail dealers in automobile tires and accessories are placed in separate classes in this bill, wholesalers being taxed \$250 a year and retailers \$25 a year. There are other proposed forms of taxation in the bill that will have a serious effect on the automobile industry in this State if it is passed. The bill providing for a tax of one cent per gallon on gasoline appears to be a certainty regardless of the efforts that have been made to defeat it.

John B. White a Bidder

SPOKANE, WASH., July 26—John B. White, president of the Washington Tire & Rubber Co., bid in the assets of the corporation when they were sold by the sheriff to satisfy a judgment given the Lincoln Trust Co. on a \$65,000 bond issue. He is understood to have been acting for himself and other stockholders.

Trade Officials to Confer with Hoover

**Conference to Discuss Compila-
tion of Census of 1921 Pro-
duction Figures**

WASHINGTON, July 26—Representatives of the National Automobile Chamber of Commerce, Rubber Association of America, and other organizations in the automotive trade will attend a conference of trade associations with Secretary of Commerce Hoover and the officials of the Bureau of Census, next Friday. The conference will discuss the best methods by which the organization may co-operate in the compilation of the biennial census covering statistics of products of manufacturing industries taken for the year 1921.

John E. Edgerton of the National Association of Manufacturers has issued a notice to members of the association and to trade bodies which are co-operating in this activity.

The Director of the Census desires this conference with representatives of the associations in order that he may consult with them concerning the number, nature and form of the various inquiries and the general scope and work of the Census Bureau, as well as the methods of co-operation with the officials of the bureau and department to facilitate the work and accomplish the best and most useful results to American industry.

Among organizations asked to send representatives to the conference are the American Iron and Steel Institute; American Supply and Machinery Manufacturers' Association; National Association of Engine and Bolt Manufacturers; National Association of Brass Manufacturers; National Pipe and Supplies Association; Heating and Piping Contractor's National Association; and Railway Car Manufacturers' Association.

Chicago Holding Own, Hopeful for Future

CHICAGO, July 25—With small losses in sales volume during the past ten days, as compared to the high spot for the month, business with the Chicago dealers is holding much better than was hoped. Sales during July have reached a high mark for the dull season and many dealers are of the opinion that August will produce business that will carry that month beyond its average volume. J. V. Lawrence, vice-president of the Henry Paulman Co., Pierce-Arrow distributors in Chicago territory, summing up the automobile situation said:

"Good business is going to continue up to about Sept. 15. About that time I look for an increase in sales to last for two months. I believe that we will sell more automobiles from Sept. 15 to Nov. 15 than we have ever sold before during the same period of the year. My judgment is that December will be dull."

American Car Wins French Classic

Duesenberg, Driven by Murphy, Shows Way to Europeans

De Palma Second in Thrilling Road Race—Flying Stones Force Two Out

How They Finished in French Grand Prix

Driver	Car	Place	Time
Murphy	Duesenberg	1	4:07:11
DePalma	Ballot	2	4:22:10
Goux	Ballot	3	4:28:39
Dubonnet	Duesenberg	4	4:30:09
Boillot	Talbot-Darracq	5	4:35:47
Guyot	Duesenberg	6	4:43:13
Wagner	Ballot	7	4:48:01
Guinness	Talbot	8	5:06:43
Segrave	Talbot-Darracq	9	5:08:06

By cable to AUTOMOTIVE INDUSTRIES

PARIS, July 25.—Jimmy Murphy, an American driver, piloting an American-made Duesenberg car, carried the Stars and Stripes to victory to-day in the post-war renewal of the classic French Grand Prix for cars with a piston displacement of 183 cu. in. (3 litres). It was the first big European race in which an American team had taken part. The distance was 321.78 miles.

Ralph De Palma, veteran American pilot, finished second, fifteen minutes later, in a Ballot. He has flashed past the stands in the lead, lap after lap, on the Indianapolis speedway in the American classic, in the same French car, but not to victory.

The race was largely a duel between Duesenbergs and Ballots. Six of the nine cars which finished carried the hopes of these two makers. There were two Talbot-Darracqs and one Talbot. The Ballots took second, third and seventh places, and the Duesenbergs first, fourth and sixth. Boillot in a Talbot-Darracq finished fifth, and the Talbot-Darracq was ninth and a Talbot eighth.

The race, on the outskirts of Le Mans, 30 times around a fast triangular course measuring 10.7 miles, was hotly contested from the first lap to the last. In the early circuits Joe Boyer, in a Duesenberg, and Jean Chassagne, in a Ballot, furnished many of the thrills. Mechanical trouble put them out near the end.



JIMMY MURPHY

Jimmy Murphy, who won the French Grand Prix for America in a Duesenberg, is one of the latest American drivers to spring into fame. He is a product of the Pacific Coast and began his racing career as mechanic for Eddie O'Donnell and later with Eddie Rickenbacker. He drove a Duesenberg in the Indianapolis races this year and finished fourth.

Boyer and De Palma ran a dead heat for first place in the initial lap, with Chassagne and Murphy neck and neck in second place. The other leaders, in order, were Wagner, Guinness, Boillot, Guyot and Dubonnet. In the first lap Wagner had clutch and carburetor trouble.

Murphy and Boyer were in the lead in the second lap, followed by Chassagne and De Palma. On the third lap the two leaders were unchanged, but Chassagne went into third place ahead of De Palma.

The cars stood in this order until the end of the sixth lap, when Boyer stopped to look at his wheels and Chassagne went into second.

At the end of the seventh Murphy stopped to change tires and take on gas as a precaution, giving Chassagne the lead. The order up to that time was, Murphy, Chassagne, Boyer, Guyot and De Palma.

While Murphy was at the pits for gas and tires, Boyer raced into second place, but Murphy soon overtook him and pressed hard after Chassagne but the Ballot held the lead until the seventeenth lap. Then Chassagne went to the pits with his gas tank leaking badly from a puncture made by a flying stone. This accident forced him to leave the track and Murphy went into first place again

(Continued on page 197)

N. A. C. C. in Split with Underwriters' Body

Severs Relations with Chicago Laboratories Over Question of Car Grouping

NEW YORK, July 27.—The National Automobile Chamber of Commerce has definitely severed relations with the Underwriters Laboratories at Chicago, an adjunct of the Underwriters Association. The last straw was the determination of the Laboratories to group cars according to mechanical construction.

The activities of the Underwriters Laboratories are regarded as too detailed. The inspections interfere with the routine of factory production and result in classifications which are illogical. Parts makers who do not submit to the laboratory tests do not get ratings and as a consequence a car may be unfairly listed because not all of its parts have been supervised, although they may be just as good or better than those inspected by the laboratories.

Few accidents to-day are due to faulty construction and automobile makers feel that nothing is gained by the tests in the Underwriters Laboratories. The high insurance rates are the result of over-valuation and failure to take into consideration the moral hazard. This virtually puts a premium on the destruction of motor vehicles.

Rickenbacker Enters Manufacturers' Field

(Continued from page 187)

in the automobile industry and has been associated with Everit and Flanders practically since the beginning of the business. Cunningham helped Alexander Winton build his first car and was chief assistant to Henry Ford when he built the old "999." He had been Ford branch manager in Detroit and continued as consulting engineer until the E.M.F. organization was started when he joined this group. His last position was that of sales engineer in charge of production in the Maxwell-Chalmers Co. Since Flanders left Maxwell-Chalmers Cunningham has been devoting his entire attention to perfecting the Rickenbacker car.

Hood has had a similar history. He has been noted as a purchasing agent in the automobile field and started as assistant purchasing agent of the E.M.F. group. He later held the same position with the Studebaker Corp. and then became purchasing agent of the Maxwell-Chalmers. His position in the new concern will be that of purchasing agent.

Willys Passes Peak of Output, Is Belief

Orders for 5-Day Working Schedule Posted—August Production 6500

TOLEDO, July 26—Willys-Overland has passed the peak of sales for the present season, it is believed by officials at the plant here, as orders were posted on Monday calling for five-day working schedule and lowering of production for next month.

The mark set for July was 12,000 cars. This has been cut to 10,500 cars, and August mark set at only 6500. The September schedule is 2750. These are only tentative, and if the trade continues as brisk as it has been during the last few weeks they will have to be revised upward.

The sales for the present week will probably temper the schedule for next month. Rarely has Overland operated extensively during the summer months.

Last week hundreds of men were laid off and during the next ten days the force will probably be cut by 2500 men. It is planned to keep a normal force of about 5000 men at work during the fall months.

President John N. Willys declared last week that the operations of the company had been so successful the last few weeks that financially it was now "out of the woods" and that it would go forward in fine shape.

He said that bank loans would be reduced on August 1 by a substantial payment in cash. The company's statement shows a cash balance on hand of approximately \$10,000,000, which will go far towards retiring the \$21,000,000 of loans. The loans were due in May but were extended until November.

It is thought by that time the plans of the creditors' committee will be ready and that a bond issue will be floated as a part of the clean-up for the loans and strengthening of the financial structure of the company.

BOSTON 'SAFETY WEEK' WILL FOLLOW BIG CONVENTION

BOSTON, July 26—Motor accidents and how to prevent them will take a prominent part in the discussions of the annual convention of the National Safety Council, which this year will have its meeting at Boston. Governor Channing H. Cox has given the officials the use of the State House and there will be some 20 meetings every day in the committee rooms at the capitol, and also on Boston Common will be staged some interesting features relative to accidents. There will be meetings also in some of the other cities in the State. Plans will be worked out for a Safety Week in Boston in which everyone will be asked to take part.

Automobile Men Buy Fletcher Bank Stock

INDIANAPOLIS, July 25—Five men prominent in automobile industrial circles of Indiana are in the group of stockholders which has acquired the interests of Stoughton A. Fletcher in the Fletcher American National Bank, leading financial institution of this State, according to announcement by the bank, made public to-day. They are Carl G. Fisher, president Indianapolis Motor Speedway and the Fisher Automobile Co.; James A. Allison, president Allison Engineering Co.; Walter Marmon, president Nordyke & Marmon Co.; Edward G. Soubier, president Stutz Fire Engine Co.; Lucius M. Wainwright, president Diamond Chain & Mfg. Co.

"It is common knowledge that I have invested a large part of my personal worth in the Midwest Engine Co., which like many other large manufacturing concerns has had its share of troubles due to the present industrial depression," said Fletcher, in connection with the announcement of disposal of his holdings.

Automobile Excise Tax to Be Retained

Little Chance of Abolition—Federal License Fee May Also Be Added

WASHINGTON, July 26—Outlook for elimination of excise taxes on automobiles is not particularly encouraging at this time when the House Committee on Ways and Means is framing a new revenue bill. The Treasury will recommend the abolition of the excess profits tax, reduction of transportation tax, reduction in surtaxes, elimination of so-called "nuisance" taxes and other minor changes. The President has been advised that the House will enact the tax bill by August 6, but House leaders say it will be fortunate if the bill is reported out of committee by August 15. Indications are that a Federal automobile license tax will be approved by the Ways and Means Committee.

The United States Chamber of Commerce advised the Ways and Means Committee that a canvass of business throughout the country showed that the second largest vote on taxation matters was for the repeal of the war excise taxes ranging from automobiles and their accessories to wearing apparel.

The sales tax which the National Automobile Chamber of Commerce had indorsed, has been definitely shelved by the House Committee on Ways and Means. As there will be no need for extra funds to meet a soldiers' bonus, the sales tax will not be necessary, though Congress must devise methods to raise \$4,000,000,000.

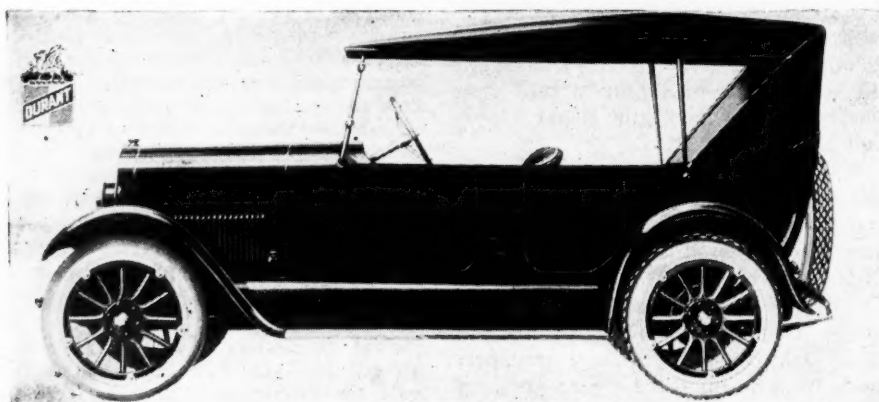
It is known that the Ways and Means Committee is likely to accept the program of tax revision, as submitted by the Treasury, because it affords the easiest way out of a difficult situation. The House Committee will undoubtedly amend the Treasury plans, but the belief exists that the recommendations of the Administration will be given as the views of the committee. The Senate Finance Committee conducted extended hearings on the sales tax last spring.

The Treasury believes it possible to enforce a Federal automobile license tax which would be paid directly by the consumer or the user.

Rush Work on Verlinden Plant of Durant Motors

LANSING, MICH., July 25—Rapid progress on the Verlinden plant of the Durant Motors Corp. is being made. The Christman Construction Co., which has erected four cement towers for work, is now completing the second floor of the main plant and its various units. Steel for structural work on the warehouse and the enameling plant is on the ground and work on this is starting to-day. The Christman company is beyond schedule on the plant and from present outlook will turn over the plant on Nov. 1.

New Durant Car and Nameplate



Durant Four, which will sell for \$890 and will be on market about Aug. 1, now on display in Long Island City

203,000 Gas Tractors Output for Last Year

Department of Agriculture Makes Statistical Report on Farm Implements

WASHINGTON, July 26—Production statistics of farm implements as compiled by the Bureau of Public Roads, United States Department of Agriculture, show that there were 203,000 gas tractors manufactured during the year 1920, with a value of \$193,000,000. These figures represent the output of 90 firms and 162,988 tractors with a domestic sales value of \$161,896,000, while 29,143 were foreign sales valued at \$30,850,000.

The statistics regarding farm implements were compiled from reports of 583 manufacturers of tractors, farm vehicles and other operating equipment. It is believed that at least 99 per cent of the manufacturers answered the questionnaire sent out by the Department of Agriculture. The reports of a considerable number of firms covered the fiscal year ending in the latter part of 1920 or the early part of 1921.

The reports of such firms do not represent exactly their activities for the calendar year of 1920, but in every case the report covered an entire year, and it is believed that for all practical purposes the totals may be considered representative of the industry for the calendar year. The total value of implements manufactured was \$537,000,000. The export of tractors represents a large proportion of the total of foreign trade in farm implements, though there were 85 firms manufacturing horse-drawn vehicles. The total value of 449,095 vehicles was estimated at \$42,423,000, of which \$40,929,000 were domestic sales.

New Buick "Four" Will Be Marketed for \$975

FLINT, MICH., July 27—The Buick Motor Co. announces the following prices on the various models of its new four-cylinder car: Touring, \$975; roadster, \$935; coupe, \$1,475; sedan, \$1,650. The engine is of the valve-in-head type, has a three bearing crankshaft and cylinder dimensions of 3½ x 4¼ in. The oiling system is a combination of pressure and splash and the cooling water is circulated by a pump. The Marvel carbureter is standard equipment and it is provided with a new automatic heating system which is interconnected with the throttle so that the amount of heat supplied is dependent on the speed of the engine.

The clutch is of the multiple dry disk type. The front universal is incorporated with the gearset and lubricated from it. Hotchkiss type drive is used and the springs are semi-elliptic all around. The wheelbase is 109 inches. The body is finished in black with a white stripe on the touring model. The shipping weight is 2380 lbs.

GAS PRICES SOARING, COMPANY INSTALLS OWN PLANT

NEW YORK, July 27 — The Doehler Die Casting Co. of Brooklyn is installing a gas manufacturing plant of its own because of the high price it has to pay for its supply from gas companies. The Doehler company figures that it can make its own gas at a cost of 40 cents a thousand cubic feet. Its bill for gas last year was \$117,000.

The Doehler company was one of a number of manufacturing concerns which some time ago petitioned the Public Service Commission for a sliding scale of rates for industrial consumers of gas, the charge per cubic feet to be reduced as the volume of gas consumed was increased. No action has yet been taken, but the Doehler company doesn't intend to take any chances.

Buyers' Strike Asked to Cut Tractor Price

Georgia Commission Tells Farmers Manufacturers Must Reduce Farm Implement Charges

ATLANTA, GA., July 26—In a statement that has been widely published in Alabama newspapers, M. C. Allgood, Commissioner of Agriculture for that State, calls upon the farmers to declare a buyers' strike against tractors and other power farming machinery until the manufacturers reduce prices. Allgood, in his statement, declares that he is taking this matter up with other agricultural departments in the various southern states with the end in view of effecting an organization and bringing the subject to the attention of Congress for an investigation.

The statement declares that while agricultural products are bringing only a small fraction of the prices paid during the war, farm implements are now selling at 100 per cent more than the prices existing before the war began.

General Motors, in Educational Booklet, Tells Stockholders Company's Magnitude

NEW YORK, July 25—The General Motors Corp. is mailing to stockholders with the Aug. 1 dividend checks, an educational booklet telling them something of the magnitude of the corporation. Few persons, even among the stock-

holders, have any definite idea of the wide ramifications of the great enterprise. The following table shows sales of passenger cars and commercial vehicles by divisions for the past four calendar years:

Years Ended Dec. 31	1920	1919	1918	1917
Passenger cars:				
Buick	111,215	115,405	74,856	117,300
Cadillac	19,826	19,801	12,279	19,692
Chevrolet	126,397	127,362	81,435	109,111
Oakland	36,155	51,901	24,110	33,951
Oldsmobile	25,713	33,345	18,822	22,045
Scripps-Booth	8,779	8,128	4,008	2,545
Commercial cars:				
Chevrolet trucks ...	13,651	6,098	384	2,664
GMC trucks	5,137	7,729	8,997	5,861
Oldsmobile trucks ..	8,239	7,782	30	15
Totals:				
Passenger cars	328,085	355,942	215,510	306,644
Commercial cars ...	27,027	21,609	9,411	8,540
Miscellaneous*	36,421	28,607	21,913	11,319
Grand total:				
Cars, trucks, tractors	391,533	406,158	246,834	324,503

*Consists of tractors; McLaughlin, Chevrolet and Olds cars produced and sold in Canada, and therefore not included in reports to National Automobile Chamber of Commerce; and also Buick and Cadillac commercial cars.

The corporation has 78 divisions, subsidiaries and affiliated companies in 35 cities of the United States and Canada. These plants embrace more than 2000 acres of land upon which there are over 1500 buildings with a floor space of more than 32,000,000 sq. ft. The Buick plant at Flint, which covers 200 acres, is 1½ miles long and ¼ mile wide. The new Cadillac plant at Detroit covers 46 acres. The central office building in Detroit is the largest office building of its

kind in the world and contains 1,400,000 sq. ft. of floor space.

In addition to the manufacturing plants, the various divisions have large investments in factory branches, service stations and retail stores in all the principal cities of the United States and Canada. Chevrolet alone has 38 retail stores. Every city of importance in the world is covered by the General Motors Export Corp. and other foreign organizations of the corporation.

Fail on Agreement on Motor Gas Range

Conferees Leave Matter to Results
of Experimental Work Now
in Progress

WASHINGTON, July 23—Inability of the conferees attending the meeting of the Technical Committee on Standardization of Petroleum Specifications to agree, left the determination of the new distillation range of motor gasoline to the results of experimental work now in progress. The suggestion that the present ninety degree point should be raised slightly was objected to on the ground that the specification should be retained unchanged until such time as an entirely new grade of gasoline can be used. The committee plans to study the specifications for aviation gasolines and for all grades of greases during the coming year and, therefore, did not set any specifications for these items.

The committee agreed that the acid heat test for gasoline and the cold test for steam cylinder and black oils were unnecessary, but the fire tests for lubricants should be continued in specifications as a check on sampling. It was decided that the new American Society for Testing Materials Methods should be adopted, though due consideration should be given the fact that these methods are still in a tentative stage. More definite color standards at a corrosion test for gasoline were also discussed.

Of interest to automobile manufacturers and owners was the belief expressed by the conferees that further definiteness would be desirable in the test for emulsifying properties of lubricants. It was shown that the words "light," "medium," etc., as applied to these oils have different meanings when these oils are used for different purposes, and a system of numbering was advocated to replace the present names for the grades. A slight broadening of the viscosity limits was suggested in order to allow several commercial grades of oil to qualify under the specifications, and a relaxing of the color and pour test standards was advocated for the same reasons.

The committee will study the suggestions submitted at the conference and recommend action by the technical committee and the interdepartmental committee.

Chemical Fuel Is Cited by Federal Commission

WASHINGTON, July 25—The Federal Trade Commission has cited Chemical Fuel Company of America, Inc., Louisville, Ky., in complaint of unfair competition in the sale of a motor fuel in interstate commerce. Thirty days are given the company in which to file answer.

According to the complaint, this company sells a motor fuel known as tri-

oxylene, which, it is stated, is advertised as having been thoroughly tested by the United States Government Bureau of Mines, and has fulfilled every claim made for it as a fuel for all classes of aircraft, seaplanes, etc., and is the most perfect automobile fuel.

The complaint alleges that these representations are false and misleading in that no official test of tri-oxylene has been made by the Bureau of Mines, and that chemical engineers in that bureau who made unofficial tests of this product did not regard it as having any commercial merit or being of scientific interest.

This citation is made after a preliminary inquiry, and initiates a proceeding to try out the case on its merits, the hearings to commence on Aug. 31.

Slow Production May Cancel Many Orders

PHILADELPHIA, July 26—A canvass of eight suburban boroughs and towns shows that while new automobiles are, in most instances, selling well, there is now danger of some of the sales being cancelled because of slowness in factory production. In not a few instances customers who have ordered cars and found they could not be delivered for many weeks, if not exceeding two months, have stated their intention, in case of non-delivery within a specified time, to cancel the order and obtain a car of another make whose factory is producing.

While the sale of accessories, with the exception of such articles as greases, windshield cleaners, and the like, is absolutely flat in most of the dealers' places as well as garages, tires are beginning to show more movement, except in far-outlying points. Trucks are slow and nothing much is being done in the line of trailers.

Blame Gas Tanks for Coast Plane Crash

Should Not Have Been Carried
at Base of Wings, Say
Aviators

BERKELEY, CAL., July 26—Placing of the gasoline tanks at the junction of the wings with the fuselage is held by aviators of this part of the country to be responsible for the total destruction of the Jacuzzi monoplane, built in Berkeley, at Modesto, Cal., July 14, with the accompanying deaths of the four men who were riding in the plane.

Harold L. Coffee, of Oakland, former overseas aviator, was piloting the Jacuzzi monoplane when it fell. With Coffee were Giocondo Jacuzzi, brother of the inventor of the monoplane and chief financial backer of the Jacuzzi Monoplane Co. of Berkeley; A. Duncan McLeish, former army aviator and attorney for the monoplane manufacturing company, and John A. Kauke, service supervisor of the Cleveland Tractor Co., also of Berkeley. All were dead when spectators reached the fallen plane.

Eyewitnesses Tell Story

The gasoline tanks were carried at the bases of the wings, and eye-witnesses of the accident say that the first sign of trouble was the explosion of one of these tanks, when the wing supporting it literally leaped from the side of the plane. A second later the other wing was seen to fall as the other gasoline tank exploded. The Jacuzzi company had been warned by local fliers prior to this flight that if either one or both of these tanks exploded both wings would be blown from the machine and the plane would be helpless in the air.

Exports of Automobiles, Airplanes, Trucks, Farm Tractors, Motorcycles and Parts for June and Twelve Previous Months

	Month of June				Twelve Months Ending June			
	1920		1921		1920		1921	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	4	\$28,700	3	\$19,500	63	\$459,394	66	\$465,955
Airplane parts....	..	9,443	..	7,837	..	643,270	..	194,440
Commercial cars..	2,697	4,216,502	418	531,234	24,356	41,577,684	17,598	29,511,955
Motorcycles	2,557	689,485	348	99,353	35,041	9,550,022	24,505	7,731,298
Passenger cars...	12,733	14,486,362	1,964	2,057,490	115,519	125,384,025	84,430	103,786,970
Parts, not including engines and tires .....	..	7,429,188	..	2,211,528	..	66,292,652	..	67,409,570

Engines

	Month of June				Twelve Months Ending June			
	1920		1921		1920		1921	
	No.	Value	No.	Value	No.	Value	No.	Value
Automobile, gas..	4,108	\$673,619	542	\$125,992	39,413	\$6,062,901	14,173	\$2,662,803
Marine, gas.....	1,084	303,488	435	166,465	10,231	3,457,524	7,023	2,636,768
Stationary, gas...	2,832	437,115	965	295,542	28,584	4,385,447	23,629	4,669,795
Tractor, gas.....	1,664	1,573,236	32	111,902	20,186	19,304,891	13,398	13,557,202
Total.....	9,688	\$2,987,458	1,974	\$699,901	98,414	\$33,210,763	58,223	\$23,526,568

Johnson Will Direct G. M. in Great Britain

Appointed Managing Director—
Succeeds J. H. Willson—
Raskob and Sloan Return

(By Cable to AUTOMOTIVE INDUSTRIES)

LONDON, July 23—Walter H. Johnson, managing director of Delco-Remy, Ltd., has been appointed managing director of General Motors, Ltd. and will have charge of the distribution of the entire General Motors line in England.

Appointment Not a Surprise Here

NEW YORK, July 26—Appointment of Walter H. Johnson as managing director of the British subsidiary of the General Motors Corp. did not come as a complete surprise. He will succeed Joseph H. Willson, who retired from the service recently and who is now in the United States.

Johnson handled the Delco and Remy products in England before the organization of Delco-Remy, Ltd., something over a year ago and when that company was formed was placed at the head of it.

When the bottom dropped out of the market for automobiles in England, General Motors was heavily overstocked in all its lines as the possibilities of the market had been greatly overrated. Liquidation is now progressing rapidly, however, and the outlook is gratifying.

Johnson came to the United States on the Aquitania with J. J. Raskob, vice-president in charge of finances, and Alfred P. Sloan, Jr., vice-president in charge of operations, who had been abroad on business for about a month. They were accompanied by Christian Lie, manager of the Paris branch of the General Motors Export Corp.

Sloan and Raskob spent all their time in London and Paris where they made a careful analysis of industrial and business conditions. They were gratified at the recent turn of events in both England and France.

Lie, who gained fame in the Ford organization, is making his first visit to the United States in two years. He will remain here about two months. Johnson will stay in this country only a fortnight, studying the General Motors organization. Willson, who is succeeded by Johnson, was manager of the Chevrolet branches in Brooklyn and New York before he joined the General Motors Export Corp. as assistant sales manager.

Murphy in Duesenberg Wins Grand Prix Race

(Continued from page 193)

in the twenty-second circuit. He held it until the finish but it was no easy victory.

In the 26th lap Guyot was running second and seemed likely to hold that position until the finish, but a stone, hurtling up from the road, intervened.

The missile hit his mechanic on the head and so nearly stunned him that when clutch trouble developed he could not crank the car.

This brought one of the dramatic incidents of the race. Arthur Duray, watching the contest as a spectator in the grandstand, realized what had happened, vaulted the fence and took his place beside Guyot as a mechanic.

The mishap dropped Guyot from second to sixth place, however, and gave DePalma, running with a leaky gas tank, the opportunity for which he had been hoping. The American veteran went into second place and never was headed.

Boyer went out on the 18th lap with a broken connecting rod, while trailing Murphy. The only other eliminations were Small in a Mathis and Thomas in a Talbot-Darracq, who was forced out two miles from home when a stone pierced his oil tank. Nearly all the drivers were cut by loose stones from the roadway.

The entire Sunbeam, Talbot and Talbot-Darracq teams were withdrawn a week before the race but 24 hours before the start two Talbots and two Darracqs were re-entered.

The Duesenbergs had a slight amount of tire trouble but the Ballots with the new Pirelli straight side cord had none. The Dunlop straight side cords used by the Talbot Darracq proved a failure and had to be changed during the race for Oldfields and Michelins.

The course was the shortest ever used in France for the Grand Prix and did not stand up to the speeds which can be made by modern cars. There were no accidents, however. Although the race was run under the auspices of the Automobile Club of France, the LeMans club played a prominent part in the arrangements and hopes to get permission from the Government to transform the road into a permanent speedway. It is not intended to close it to ordinary traffic but to provide permanent stands, pit, barricades and bridges. Half the course was a national highway, very wide and almost straight with a maximum grade of 3 per cent.

All the cars were equipped with 8-cylinder ahead engines except Goux's Ballot which had 4 cylinders of 2 litres piston displacement, and the Mathis which had a 4-cylinder motor of 1½ litres displacement. The smaller Ballot was entered, however, only because of the wrecking of the 8-cylinder used by Renard, who was killed in practice. It finished third and its success promises well for the 2-litre Indianapolis race in 1923.

The Ballots were on the same general lines as those entered at Indianapolis. DePalma drove the same machine he used in the American race except for a new engine.

The Talbot and Talbot-Darracqs were built along the same general lines after the design of Louis Coatalen.

The Duesenbergs differed in several respects from the European cars. They had no Hotchkiss drive, they had hydraulic brakes on all wheels, the total weight was lower and they had a left hand drive for a race run clock-wise.

METAL MARKETS

UNNOTICED at first, because overshadowed by the financial highlights which featured the now famous Henry Ford interview, one of the Detroit passenger car builder's remarks is now coming in for considerable discussion by steel producers and buyers, because of its vital bearing on the market. Mr. Ford stressed the fact that the Ford Motor Co. was no longer buying its supplies months ahead, but from month to month. Producers argue that, if this method of steel buying were to become a permanent and general custom it would necessarily bring about enhanced costs. In the last few months steel mills have had to take orders of the hand-to-mouth buying sort, and were glad at that to get them. But buying of this sort amid the abnormal conditions of the last few months is one thing and a permanent doing away with contracts for a reasonable time ahead quite another. The entire structure of the steel industry is reared on a sufficient backlog of orders to enable mills to anticipate their own wants in the way of ore, coke, limestone and other raw materials. Mr. Ford himself placed an order the other day for 135,000 tons of iron ore for his River Rouge furnace; if he did not provide himself with the ore necessary to keep his furnace in blast in winter time, while lake navigation is open, he would have to pay rail transportation, thus adding considerably to the cost of every ton of iron. Non-integrated steel mills are no less compelled to anticipate their wants on the basis of contracts in sight, if they are to produce economically. Only a few days ago such sheet mills had opportunity to buy sheet bars at a considerable saving, but without any backlog of sheet orders on their books they naturally felt timid. Automotive purchasing agents, no less than steel producers, appear to be of the opinion that, once the steel market has settled down to a more dependable course than that which has been in vogue of late, there will be a return to the system of placing orders for reasonable tonnages a sufficient time ahead to warrant mills in operating on a dependably economic basis which will redound to the consumers' benefit. For the time being the market remains in a plastic condition, with much talk of further downward revision in "official" prices, but a steady increase in the volume of demand. While further announcements of price reductions are by no means precluded and may come over night, the market generals may first permit competition to reveal more clearly whether such cuts are necessary and what their extent should be.

Pig Iron.—Blast furnace interests are beginning to assume a more firm attitude and bids below the market have less chance of acceptance than heretofore.

Steel.—The Trumbull Steel Co., Warren, Ohio, is rolling a substantial order of strip steel for Ford Motor Co.'s account. The latter interest as well as other automotive manufacturers figure in extensive bolt and nut transactions in the Cleveland market. As a result, the market for nuts and bolts has turned firmer. In the sheet market, where there are numerous reports of price concessions, the situation seems to be that mills which can make immediate shipment usually obtain full or close to full prices, while on deferred shipments concessions of \$2 a ton and upward are more or less frequent. Demand for full finished automobile sheet is slightly lower.

Tin.—Cheapness of this metal has failed to bring about better demand.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

The outstanding feature in the credit world last week was the reduction of rediscount rates by four of the Federal Reserve banks and similar action by the Bank of England. The announcement was made on Wednesday by the New York, Boston, Philadelphia and San Francisco banks that the new rate for all rediscounts and advances had been fixed at 5½ per cent to take effect on Thursday, July 21. This is the third reduction announced in the current year by the New York Federal Reserve Bank. This action reflects the improved credit situation and is evidence of the belief by the authorities in control of the Reserve Board's policy that money rates are not likely in the near future to show any sustained and decided firmness. On Thursday the Bank of England also announced a reduction of its rediscount rate to 5½ per cent, reflecting the improved credit situation in England.

The lower discount rates were made possible by the continued improvement in the reserve position of the Federal Reserve System. During the week gold reserves of the system increased \$15,554,000, and total discounts declined \$17,831,000 and Federal Reserve notes in circulation \$39,220,000. Federal Reserve notes in circulation, \$2,564,613,000, were at the lowest point since Aug., 1919. Total earning assets of the system declined \$35,392,000, while deposits declined less than \$1,000,000. As a result of these changes, the ratio of total reserves to deposit and Federal Reserve note liabilities combined increased from 61.6 per cent to 62.5 per cent, and the ratio of gold reserves to Federal Reserve notes in circulation, after setting aside 35 per cent against deposit liabilities, increased from 78.9 per cent to 80.6 per cent. The improvement was even more marked in the case of the New York Federal Reserve Bank, where the reserve ratio increased from 68.7 per cent to 70 per cent and the ratio of gold reserves to Federal Reserve notes in circulation, after setting aside 35 per cent against deposit liabilities, increased from 102.8 per cent to 105.9 per cent. Gold reserves of the New York Bank increased \$13,059,000, while Federal Reserve notes in circulation declined \$8,947,000 to the lowest point since July, 1918.

In spite of the advancing crop moving demands, there are distinct signs of easier money. This became really apparent in the local market following the announcement by the New York Federal Reserve Bank of the lowering of its rediscount rate. Call money ranged from 5 to 6 per cent as against a range of 5½ to 6½ the previous week. For the first three days of the past week a uniform rate of 6 per cent was quoted, but on Thursday, following the announcement of the rediscount cut, 5½ per cent became the renewal rate for the re-

mainder of the week. On the "outside" market, 5½ per cent money was said to be available at all times, and near the close of the week call funds could be obtained for 4½ per cent. Time money continued unchanged at 6 per cent to 6½ per cent for all maturities from sixty days to six months, until Thursday, when loans secured by mixed collateral declined to 6 per cent and "all-industrial" loans declined to 6-6¼ per cent. Trades were few, however, and unimportant. Commercial rates were also affected by the easier trend in the money market. Sixty to ninety days' indorsed bills and prime six months' paper were quoted at 6 per cent to 6¼ per cent, as against 6¼ per cent to 6½ per cent the previous week. While there was a good demand, the supply of high-grade paper was light and was absorbed in the main, it was said, by out-of-town banks.

Ford August Output to Set New Record

DETROIT, July 26—Production schedules for August, breaking all previous monthly records, were announced by the Ford Motor Co. to-day.

During August 109,700 cars and trucks are to be made in the United States. The best previous figure is July production, expected to be 109,000. Previous to July, the figures are June, 108,962, and May, 101,464.

The figures given are for the United States alone. The Manchester (England) and Canadian Ford plants expect to increase from 225 cars daily to 300 cars daily during August. No definite schedules have been prepared for these plants as yet, however. This would bring the total world's production of Ford cars and trucks for August to 117,800, surpassing all previous marks.

In addition to the car and truck schedules, it is announced at the River Rouge tractor plant that 200 tractors daily are scheduled for August, or a month's production of 5400 tractors.

Repair parts which would make approximately 150 cars daily are to be produced. The motor production schedule calls for 4200 motors daily.

GASOLINE STOCKS GROW

WASHINGTON, July 26—Production of gasoline continues to increase as refinery statistics issued by the Bureau of Mines show that the daily average production for May was 14,469,931 gallons, which is 262,758 gallons larger than the production for the preceding month, and an increase of 1,129,640 gallons over the daily average production for the year 1920. Stocks on hand at the refineries were increased by 55,272,887 gallons over stocks of April 30. The May exports of gasoline amounted to 39,858,771 gallons, while domestic consumption amounted to 354,263,486 gallons. The daily average consumption for the month of May shows a decrease of 318,120 gallons from that for the month of April, also a decrease of 1,703,413 gallons from daily average of May, 1920.

FINANCIAL NOTES

General Motors Corp. bank loans now approximate \$66,000,000, a reduction of about \$16,000,000 from notes payable of \$82,000,000 as of December 31 last. Cash on hand is in excess of \$50,000,000, compared with \$47,608,000 seven months ago. Inventories are below \$153,000,000, or \$11,000,000 less than at the beginning of the year. While earnings this year are likely to show a considerable falling off from 1920 net profits of \$37,750,375, or \$1.58 a share on the common after all charges and preferred dividends, indications are that the company's financial position will be a great deal stronger at the end of 1921 than at the close of 1920.

Pierce-Arrow Motor Car Co. shows an operating loss of \$828,866 for the three months ended June 30, after allowing for maintenance and depreciation. This compares with a profit of \$1,432,706 in the corresponding quarter of 1920. Allowances for Federal taxes and other items called for \$571,684 in the second quarter of this year, making a total deficit of \$1,400,550, compared with a surplus of \$705,779 in the three months ended June 30, 1920.

Mason Tire & Rubber Co., in a comparative balance sheet as of May 31, shows cash of \$13,947, against the figures of April 30, 1920, which were \$803,919. Accounts and bills receivable are \$707,722, against \$1,033,149 in April, 1920. Inventories are \$2,628,959, against \$2,245,654 the previous year. Bills and accounts payable amount to \$842,309, in comparison with \$405,228. The surplus is \$126,219, against \$651,538.

Willys-Overland, Inc., of Toledo, has applied for a temporary receiver for the Overland-Houston Co., local distributors of Overland cars. An injunction has been issued restraining the officers of the company from interfering with the assets. Willys-Overland, Inc., the parent company, asserts that it holds a lien on the capital stock of the other concern, the assets of which are estimated at \$130,000.

Sims Magneto Co., in a comparative balance sheet as of December 31, shows cash of \$154,836, as against \$101,858 for 1919. Notes and accounts receivable \$629,394, against \$192,963. Inventories are \$912,842, against \$683,451. Notes and accounts payable \$1,221,908, against \$332,979. The surplus figures are \$590,054, against \$588,393.

Nash Motors Co. has declared a dividend of \$6 a share on the common and a regular quarterly dividend of \$1.75 a share on preferred, both payable August 1.

Wholesale Tire Co., New York, has filed schedules in bankruptcy, listing liabilities of \$55,778 and assets of \$20,323.

Stewart-Warner Speedometer Corp. has declared the regular quarterly dividend of fifty cents on the common stock, payable August 13 to stock of record July 30.

International Harvester Co. has declared a regular quarterly dividend of \$1.75 on the preferred stock, payable September 1 to stock of record August 10.

RECEIVER FOR OHIO TIRE

TOLEDO, July 27—William J. Slater, Akron, has been appointed receiver for the Ohio State Rubber Tire Co., Sandusky, by Federal Judge Killits here. Bankruptcy proceedings were started here against the company by Edward Maurer, Inc., of New York, when they filed a bill of complaint.

MEN OF THE INDUSTRY

L. M. Bradley, of New York, has been appointed sales manager of the New Era Spring & Specialty Co., Grand Rapids, Mich. Mr. Bradley has been in the automotive industry for twenty-two years, his activities dating back to the steam car days. He has been connected with the Willys-Overland, Studebaker, U. S. Motors, R. & V. Knight and for four years was assistant general manager of the old American Motor Car Manufacturers Association of New York, which was formed by Henry Ford to combat the famous Selden patent suit. He has been advertising manager of the "American Motorist" and for three years general manager of the Motor and Accessory Manufacturers Association at New York. He is a former newspaper man.

Major Irving C. Moeller, who has been manager of the Cleveland branch of the Mack International Motor Truck Corp., has been transferred to the general offices of the company in New York. He was guest at a farewell dinner given in Hotel Winton by the Cleveland Automotive Trade Association, of which he was vice-president. **M. F. Parsons**, manager of the Syracuse branch, Major Moeller's successor, was elected a trustee of the association.

Frank H. Golding, formerly general manager of the Holmes Automobile Co., Canton, Ohio, has been appointed general manager and treasurer of the Fox Motor Car Co. **H. O. Swanson**, formerly in the service and engineering departments of the H. H. Franklin Co., makers of Franklin air-cooled cars, has been appointed chief engineer. The new plant with 100,000 square feet of floor space is capable of producing 2500 air-cooled cars a year.

Earle S. Barber, who resigned as Director and Sales Advertising Manager of Alfred Decker & Cohn, Chicago, has engaged in business as Earle S. Barber & Co., "Commercial Counsellors." They will cover the various branches of business and will maintain a sales organization for obtaining distribution and maintaining efficient representation in five states—Illinois, Indiana, Iowa, Michigan and Wisconsin.

W. R. Hyde, for several years special Western representative of Hilo Varnish Corp., with headquarters in Chicago, will take over the New York and Pennsylvania territory, formerly covered by J. Frank Brown. The new territory, which is not new to Hyde, as he looked after it in former years, will offer a splendid opportunity for the development of business in the industrial field.

George R. Wright, who for the past eight years has been manager of the Philadelphia branch of the Chevrolet Motor Co., has been appointed distributor for the new Durant line in Philadelphia and the surrounding territory. The present home of the Oakland car at 918 North Broad Street has been leased by Wright for a term of years for the Durant.

George T. Briggs is again connected with Wheeler-Schebler Carburetor Co., Indianapolis, as general sales manager. Briggs was associated with the Sinclair Refining Co. as manager of the Automotive Division, and more recently as general manager of the Motorcycle and Allied Trades Association.

Arthur H. Lacey, formerly assistant director of engineering with the Hall-Scott Motor Car Co., and who is now a consulting engineer in Oakland, California, has taken larger offices where with increased facilities,

he states that engineering problems will be taken care of most efficiently.

Vance McCarty, one of the most prominent men in the leather belting industry, has been elected vice-president of the Chicago Belting Co. He leaves the Edward R. Ladew Co., Inc., of which he was vice-president.

K. H. MacQueen has been appointed assistant to the general manager of the Bearings Service Co., at Detroit. MacQueen was associated with the Bearings Service Co. at the time it was formed.

INDUSTRIAL NOTES

Frank B. Anstead, president of the United States Automotive Corp., has announced the formation of the Fayette Painting and Trimming Co., a new subsidiary of the automotive corporation, with a capital stock of \$500,000 in common shares. The new company will engage in the painting and trimming of the bodies for the Lexington Motor Co., which is the principal subsidiary of the United States Automotive Corporation.

Bantam Ball Bearing Co. announces that widespread distribution has resulted in a demand for replacement bearings and the company has just added a replacement department to its organization. **J. H. Kraus**, in charge of this department, is now arranging with dealers throughout the country to carry a stock of various bearing applications for replacement service.

Positive Lock-Bolt Co. has purchased the entire assets of The Safety Nut & Bolt Co. The new organization is a \$250,000 Ohio corporation, with the following personnel: **C. C. Murphy**, president; **J. N. Leatherman**, vice-president; **M. D. Neff**, secretary; **Edna B. Craft**, treasurer; **W. H. Burke**, general manager; **H. L. Jollay** and **Wm. F. Koehn**, directors.

American Malleable Co., Owosso, Mich., has opened one furnace giving employment to 150 men. This makes the number of men now employed by the factory 300. The recent increases in business have come from the Buick plant which is increasing materially its production. The local plant furnishes several parts for the Buick car.

Collapsible Rim Corp., New York City, has announced full production of Standard collapsible rims in all the popular sizes. The rim is indorsed as being thoroughly practical and scientifically right. It operates in an entirely new manner and is said to relieve the motorist of all the annoyance that follows tire trouble.

American Motor Body Co. has filed plans for an addition and other improvements for the works of the Hale & Kilburn Corp. at Philadelphia.

Webster & Perks Tool Co. has sold its grinding and polishing stand and accessory department to the Hill-Curtis Co., Kalamazoo, Mich.

CREDIT CONDITIONS BETTER

INDIANAPOLIS, IND., July 20—Credit conditions are improving materially, according to executives of the various automobile financing organizations of this city. Collections in every one of the companies now are approaching the 100 per cent mark.

Interest Is Centered on U. S. Air Policies

President Understood to Favor a Central Bureau of Aviation for Country

WASHINGTON, July 19—Considerable interest is being manifested as to the air policy the Government may adopt in connection with the work of reorganizing the different departments, which is now well under way. There can be no question that difference of view obtain, but it is understood that the President is in favor of creating a central bureau of aviation, which might be established in some Government department rather than as an individual unit.

It is known to be the opinion of the Administration that a distinct aviation bureau would develop more creative genius as well as economy than is possible now under the present system of having different aviation services under various bureaus, such as the War, State and Post Office departments. There can be no doubt that study of the aviation problems has convinced the Government of the desirability of establishing a commercial aircraft industry on a paying basis, not only because of its importance to trade and business in peace times but because of its availability in times of emergency. Among the problems that have presented themselves, however, is that of maintaining production sufficient to encourage different concerns to engage in the industry. This, of course, would require the distributing of awards for aircraft, and it is stated that it has not definitely been determined how the Government may aid in this direction.

Plans for reorganization of the Government departments, while progressing, have not as yet reached a point where specific recommendations have been determined upon in regard to the establishing of a fixed air policy, but it is believed that the organization of a central bureau will result.

President Harding has nominated **Capt. W. A. Moffett** as Chief of the Navy Department's Bureau of Aeronautics with the rank of rear admiral. **Capt. Moffett** has been interested in aviation for several years and is at present in charge of the naval aviation here.

JORDAN GOING CAPACITY

CLEVELAND, OHIO, July 26—Distributors here at a meeting at the factory of the Jordan Motor Car Co. were told that factory capacity for the next four months has been sold and that production will be maintained at the organization's highest average. The Jordan Co. during the quarter just ended shipped ten per cent more cars than in the same period last year, which was the peak of the automobile sales boom. Distributors reported fewer cars on their floors July 15 than at any previous time in the company's history. This is attributed to the sales increase which followed the price reduction in May.

Calendar

SHOWS

- Sept. 5-10—Indianapolis, Automobile and Accessory Show in conjunction with Indiana State Fair, conducted by Indianapolis Automobile Trade Association, John B. Orman, Mgr.
- Sept. 28 - Oct. 8 — New York, Electrical Exposition, 71st Regt. Army, Electric Equipment, Machinery and Vehicles.
- Nov. 27-Dec. 3—New York, Automobile Salon, Hotel Commodore.
- January — Chicago, Automobile Salon, Hotel Drake.
- Jan. 7-13—New York, National Automobile Show, Madison Square Garden, Auspices of N.A.C.C.
- Jan. 28-Feb. 2—Chicago, National Automobile Show, Coliseum, Auspices of N.A.C.C.

- Sept. 9 to 17—Ottawa, Ont., Can.—Ottawa Motor Show.
- Feb. 6 to 11—Winnipeg, Can., Automotive Equipment Show, Western Canadian Automotive Association.

FOREIGN SHOWS

- September—Buenos Aires, Argentina, Passenger Cars and Equipment. La Pabellon de las Rosas. Automovil Club Argentino.
- September—Buenos Aires, Argentina, Cars, Trucks, Tractors, Farm Lighting Plants and Power Farming Machinery. Palermo Park; Sociedad Rural Argentina.
- September—Luxemburg, Luxemburg, Agricultural Sample Exhibition.
- Sept. 5, 1921—Constantinople, Traction trials under the direction of the Turkish Ministry of Agriculture.

- Sept. 23-Oct. 2—Berlin, German National Automobile Show, Auspices of German Automobile Mfg. Ass'n and German Automobile Club.
- Oct. 5-16—Paris, France, Paris Motor Show, Grand Palais, Administration de l'Exposition Internationale de l'Automobile, 51, Rue Pergolèse, Paris.
- Nov. 4-12 — London, British Motor Show, Society Motor Mfrs. and Traders.
- March, 1922—Santiago, Chili, Annual Automobile Show.
- May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.
- Sept. 1922—Rio de Janeiro, Brazil, Automobile exhibits in connection with the Brazilian Centenary Association Automobilista Brasileira.

CONVENTIONS

- Sept. 14-15-16—Portland, Ore., Credit Convention Motor and Accessory Manufacturers Association.
- Oct. 12-14—Chicago, Twenty-eighth Annual Convention National Implement & Vehicle Ass'n.
- Nov. 22—New York, Convention of Factory Service Managers, National Automobile Chamber of Commerce.
- Dec. 27-29—Chicago, American Society of Agricultural Engineers, Auditorium Hotel.

RACES

- July 25—Grand Prix, Le Mans.
- Labor Day—Unlontown, Pa., Autumn Classic.

No More Price Cutting, Says President Willys

TOLEDO, OHIO, July 26—In discussing the price question upon his arrival for a few days' consultation with factory officials, John N. Willys said:

"I have been asked several times lately about the future price situation. So far as we are concerned it is very simply answered; there have been one or two so-called second cuts on certain automobiles which in reality were just a slight trimming down of prices. When we decided to reduce our price we went all the way. The present extra price of \$695 on Overland is a reduction of approximately 33 per cent. We made this reduction because we wanted to get the benefit of big volume business and we are getting it.

"I am confident that the financial interests of the country will continue to do their best to support legitimate, hard working dealers in maintaining the proper stock of automobiles and I know the dealers who have automobiles on hand can sell them and are selling them.

"I believe, however, that a complete evolution in the method of selling automobiles is in progress. Dealers and distributors are conducting their business on sounder lines. They are systematically going after business and watching their costs in a way they never did before."

7 Goodyear Directors Elected in Dominion

TORONTO, ONT., July 26—The special general meeting of Goodyear Tire & Rubber Co. of Canada, for the purpose of electing seven directors under the new plan, four by common and three by preferred and prior preferred shareholders, resulted in the election of, for the common, A. H. Carlisle, E. G. Wilmer, G. M. Stadelman and P. W. Litchfield, and for the preferred, B. A. Thompson, of Nesbitt & Thompson, Montreal; J. A. McAllister, nominee of Dominion Securities, Toronto, and J. G. Lane, present secretary of the company.

In answer to questions raised by a few preferred shareholders, General Manager A. M. Carlisle stated that the issue of 6 per cent prior preferred stock had all gone to the parent Akron company at par in liquidation of indebtedness. The sum issued was \$2,826,000, as against an authorization of \$4,500,000, which had been legalized, but which had not all been required, and the balance of which was not for sale. Mr. Carlisle also stated definitely that not one share of common had been bonus stock. Every dollar's worth had been issued for value received or interest due. This common stock was cut from \$100 to \$10 par in the course of the reorganization.

Buys Rubber Company, Pays \$22,422.93 Taxes

COLUMBUS, July 20—By a decision in the Federal Court in Columbus, the Allen Motor Co. will be compelled to pay \$22,422.93 in Federal income taxes which was assessed against the Scioto Rubber Co. Although the decision is local, the effects are far reaching and will affect many similar cases.

The Allen Motor Co. took over the plant and property of the Scioto Rubber Co. April 29, 1919. In the article of agreement the Allen company assumed all of the legal debts of the rubber company. After the purchase Federal agents found that the income tax unpaid for 1917 was \$3,304.76 and for 1918, \$19,117.17. The Scioto Rubber Co. was no more as its assets had been merged with the Allen Motor Co.

Stratton-Bliss Gets Dodge

NEW YORK, July 20—The Stratton-Bliss Co., holding the Dodge Brothers franchise in New York City, has discontinued its contract with the Elsey Motor Co., which had the Dodge in the Bronx. Both sales and service will be handled at the Stratton-Bliss branch, Grand Concourse. Charles J. Quinn, who has been with the headquarters sales department of Stratton-Bliss on Broadway, has been made manager of the branch.

Standardized Traffic Adopted in Bay State

BOSTON, July 26—Motorists traveling throughout Massachusetts in the near future will not be mixed up on traffic signals, for plans have been outlined whereby the different police departments will adopt standardized regulations to govern traffic. This was brought about as a result of a conference yesterday at the Massachusetts Automobile Club attended by more than 100 chiefs of police and representatives of the Safe Roads Federation.

Following an all day session it was voted to appoint a committee to take up the matter. This committee comprises Chief Michael Feeney of Fall River, chairman; Deputy Chief Thomas McMurray of Worcester, Chief Edward P. Doherty of New Bedford, Chief James H. McKenna, Waltham, Capt. Bernard J. Hoppe, Boston Traffic Squad, and Capt. George A. Parker of the State Motor Patrol.

The conference voted also that it was the sense of the meeting that in the opinion of those present:

Motorists who drive under the influence of liquor should be sent to jail instead of being fined.

Pedestrians should be made to cross the street at protected crossings in the interest of safety.

See Reduced F.O.B. Rates in Proposed Schedule

ATLANTA, GA., July 26—Material reduction in the f.o.b. rates from the Central Freight Association, or automobile, territory to Atlanta may be effected if the new schedule of freight rates for the Southeast is adopted, it was indicated at a conference of shippers and carriers held recently in the Chamber of Commerce, Atlanta.

The new rate scale was introduced in the proceedings by B. M. Goodwyn, chairman of the fourth section committee of the Interstate Commerce Commission.